NOVEMBER 1960

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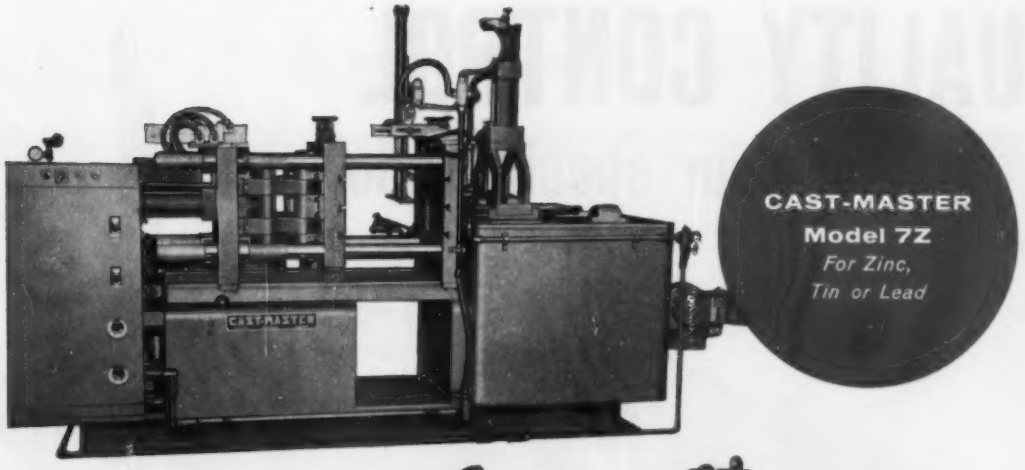

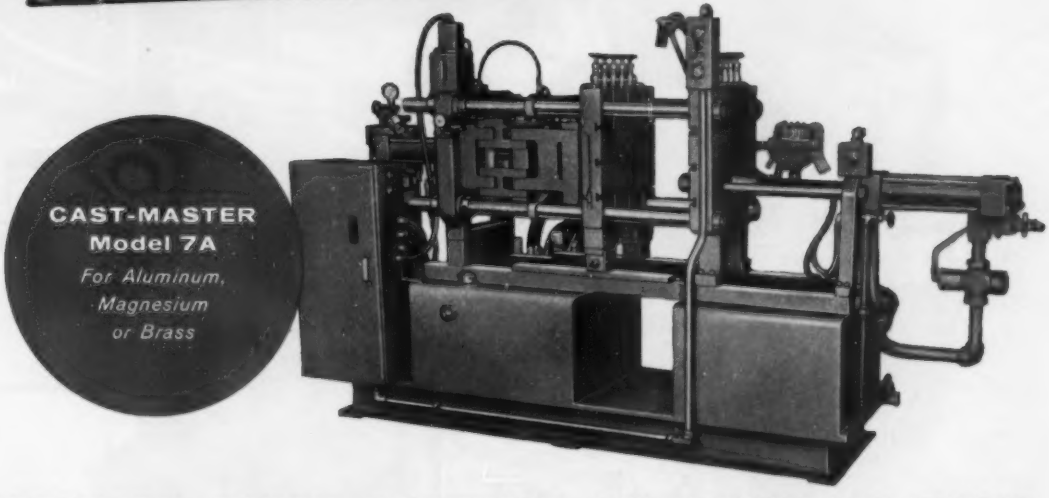

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Die Locking Pressure	100 tons	100 tons
Distance between rods HxV	13½" x 13½"	13½" x 13½"
Tie rod centers, HxV	16" x 16"	16" x 16"
Tie rod diameter	2½"	2½"
Die mounting plates, TxHxV	3½" x 21½" x 21½"	3½" x 21½" x 21½"
Die thickness	4" min., 19" max.	4" min., 19" max.
Die stroke	4" min., 8" max.	4" min., 8" max.
Shot position	On center or 4" below	3½" below center
Shot cyl. dia.	2½"	3⅝"
Shot cyl. stroke	6½"	11"
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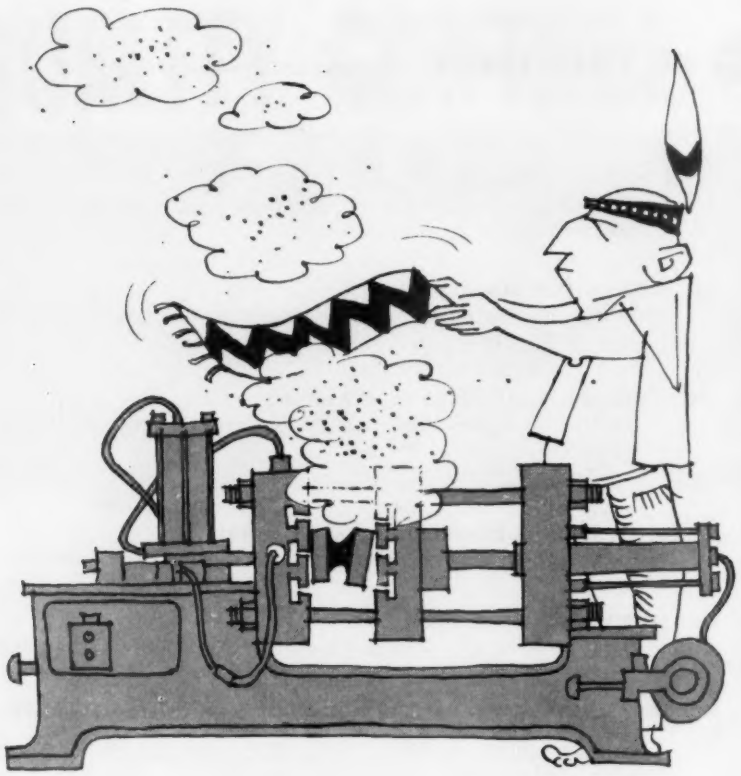

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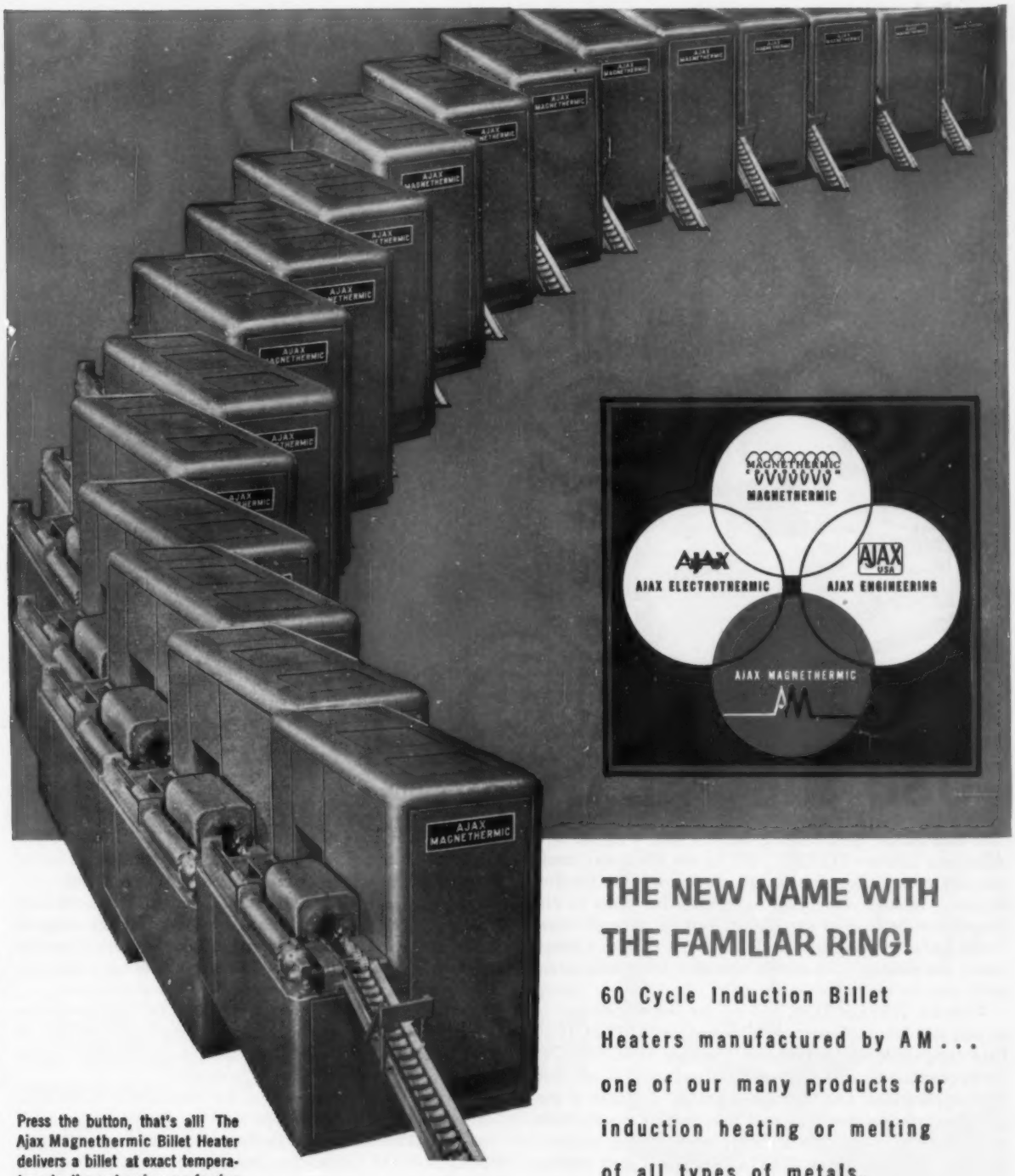

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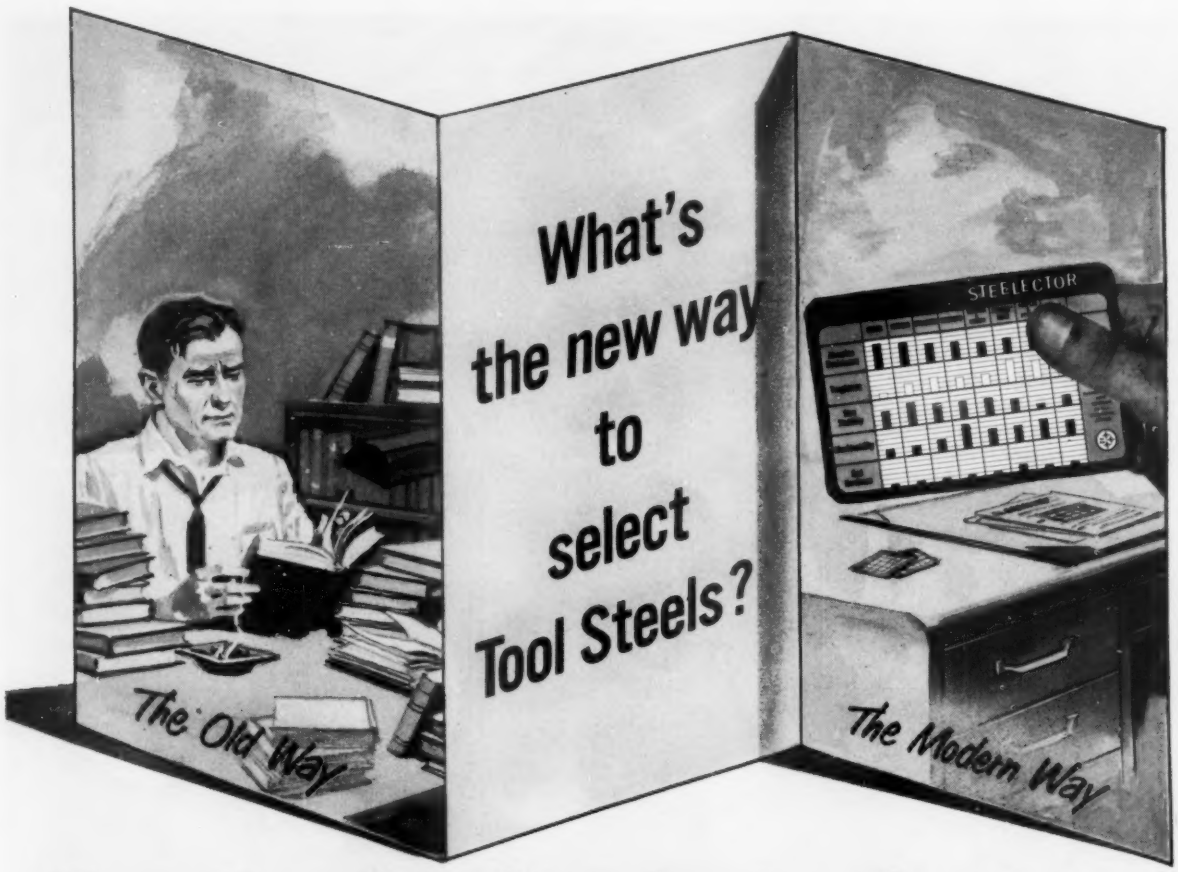

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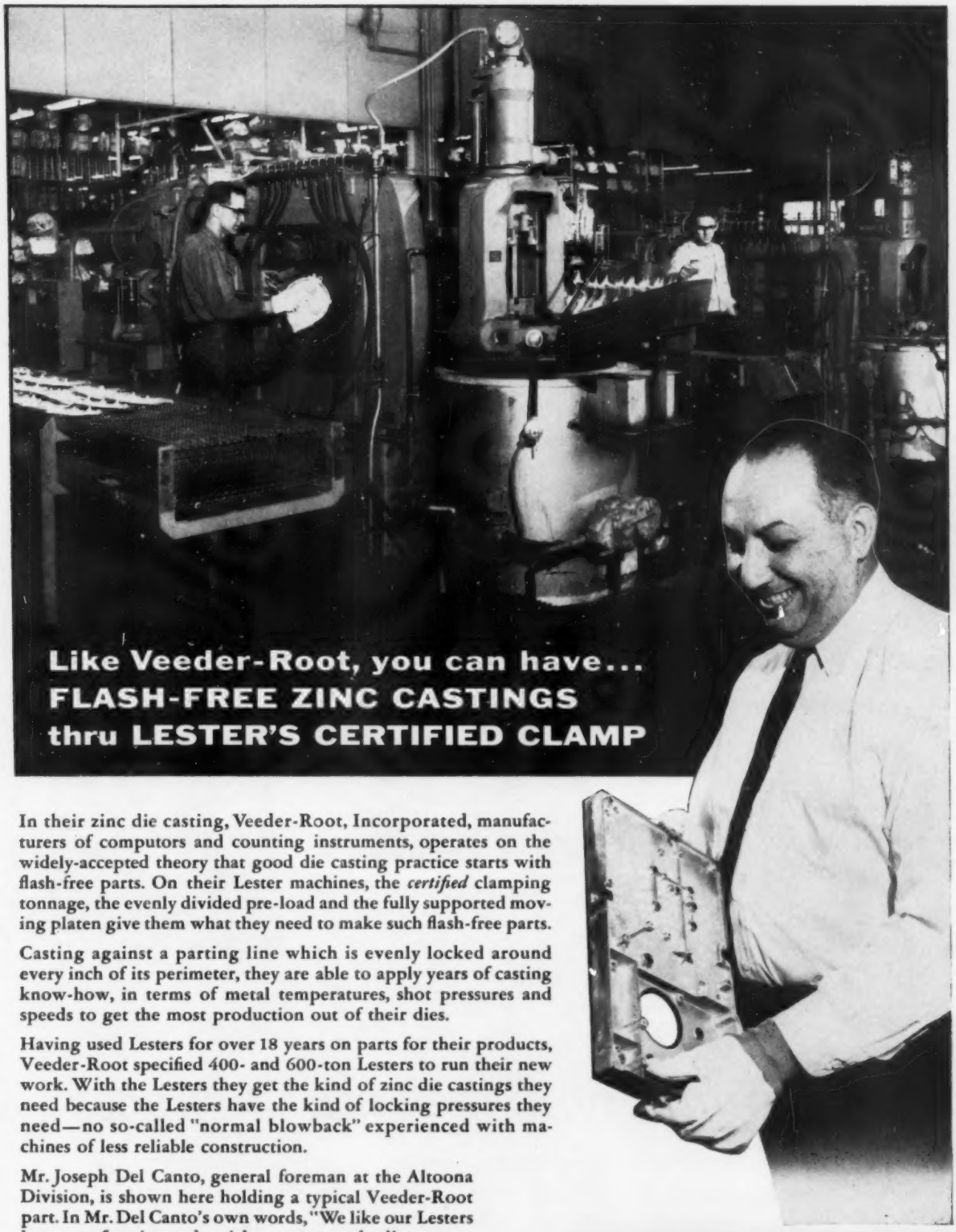

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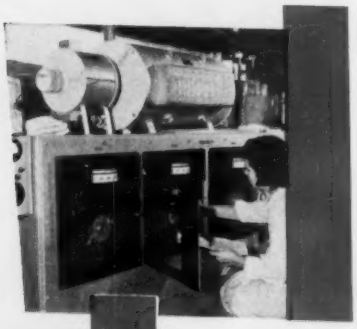

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SPHERICAL METAL POWDERS may allow designers of sinterings to improve their products, according to the Linde Co., which has developed a new method for making these powders.

Particularly in sintered parts which require controlled porosity—such as filters, burner plates, sweat-cooled nozzles, porous piston rings, and the like—the uniform spherical shape should contribute to better design. Linde also believes that the addition of from 10% to 20% of sperical particles can improve the flow of angular particles into dies, and improve the quality of other sintered parts.

The expected benefits to be gotten from spherical powders appear to be based mainly on theoretical considerations, as there is practically no experimental data available on actual sinterings made from these powders.

Currently, the company is making six different powders—copper, aluminum, nickel, 316 stainless steel, tungsten, and nichrome. Starting material is 1/16″ dia. wire of uniform cross-section. The wire must be free of surface imperfections and of the purity desired in the finished powder. It is turned into powder in an inert atmosphere by an unrevealed process (it is believed to resemble somewhat Linde's flame-plating process). The inert atmosphere prevents the introduction of impurities during manufacture, but does not prevent surface oxidation. Further, there is oxidation during handling, shipment, and storage.

Particle size range is between 10 and 150 microns, and 98% of the particles are spherical. They can be separated very accurately into various particle size ranges, at least in the laboratory. A typical screen analysis of nickel powder is given in figure 1 and photomicrographs of both nickel and tungsten powders in figure 2. The true spherical shape is clearly evident.

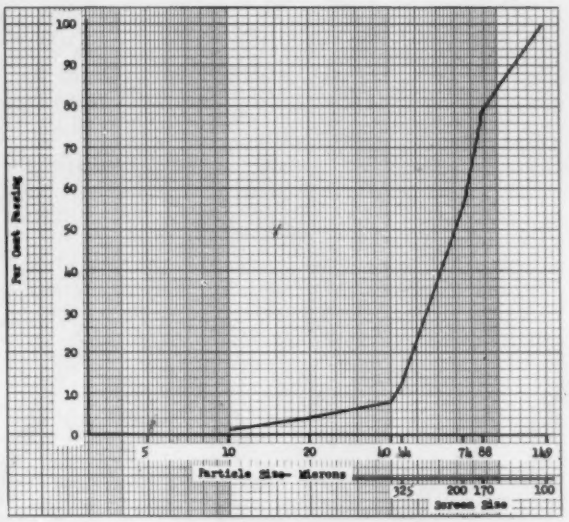
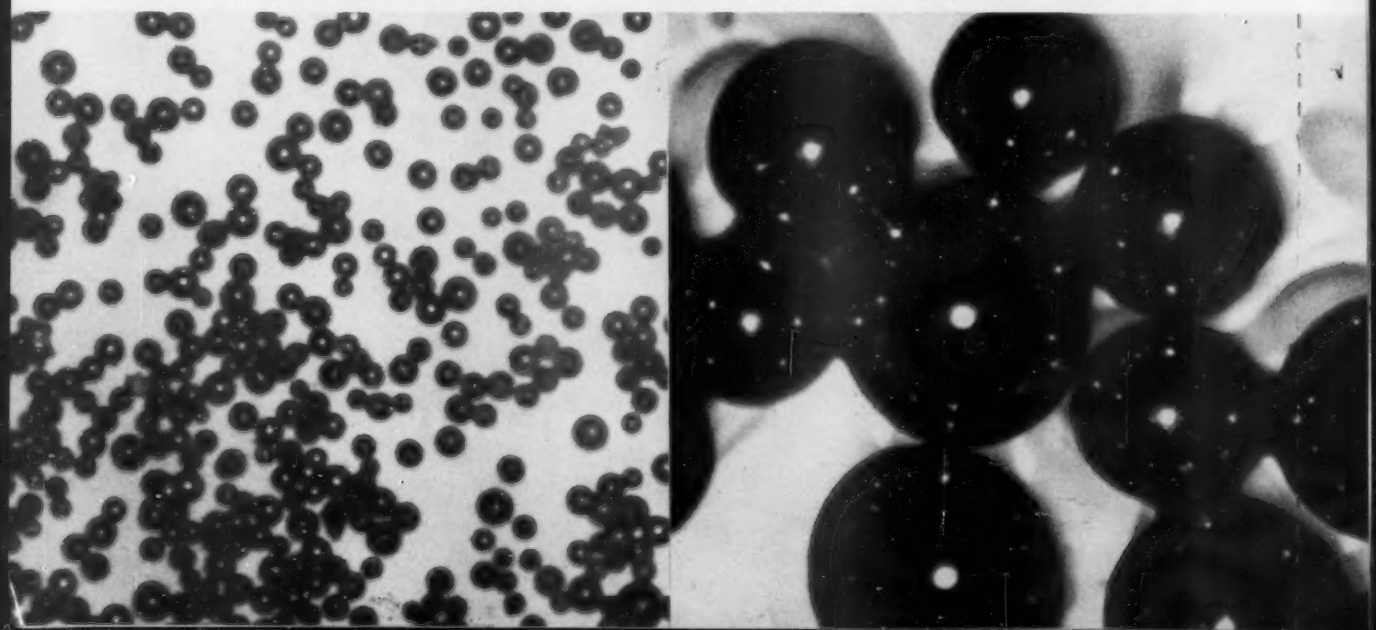


FIG. 1 PARTICLE SIZE analysis of spherical nickel powder.

Prices of these spherical powders are high. They range from $16 per pound for 316 stainless up to $35 per pound for tungsten.

Linde believes its process can be used on almost any metal which can be made into 1/16″ dia. wire.

FIG. 2 PHOTOMICROGRAPHS of spherical nickel (left) and tungsten (right) powders. Magnification 100X.



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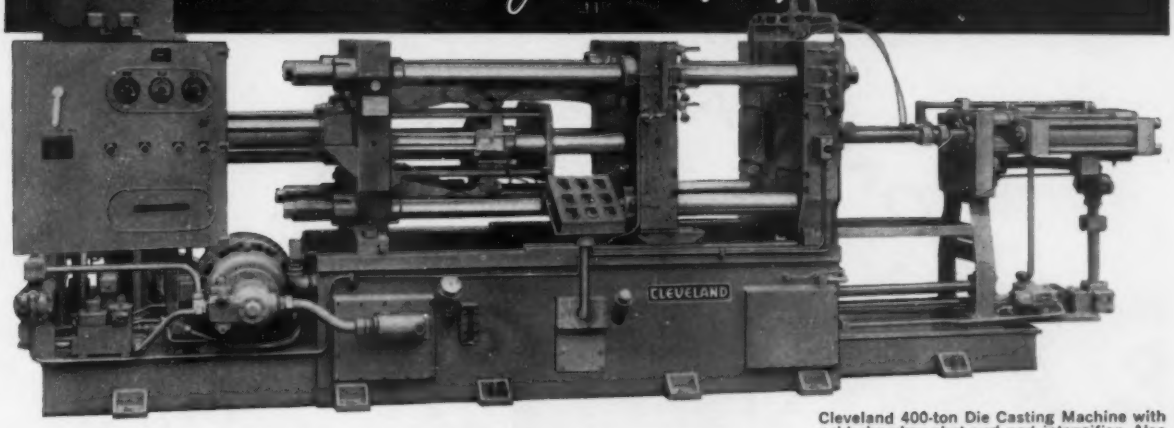

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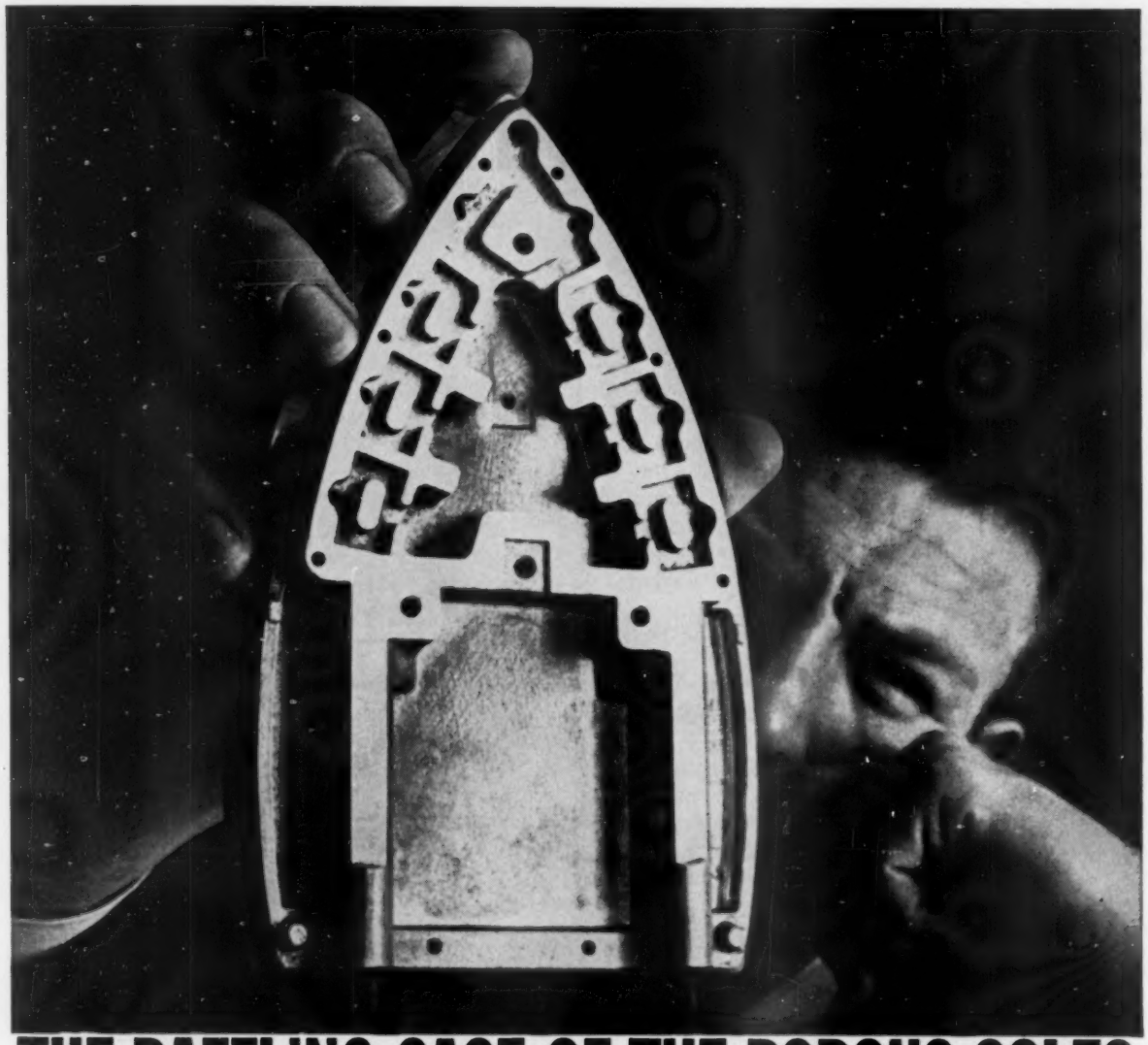

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Another costly mystery—solved by the man from Kaiser Aluminum

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LOS ANGELES, CALIFORNIA
Aaron Ferer & Sons, Inc.
MAdison 5-1553

PHILADELPHIA, PENNSYLVANIA
George Sall Metal Co., Inc.
Pioneer 3-2828

SEATTLE, WASHINGTON
Materials Reclamation Co., Inc.
PArkway 2-0133

PMM LETTERS

the readers' forum

SLUSH CASTING

For a number of years I have made rubber molds and the like and have made many things from plaster of paris and from lead. I need further help with this work.

I want to produce a Horse Penny Bank. Later I would like to be able to produce other types of animal banks. These banks are made from a low melting point material.

Are brass molds difficult to make? What is a good, low melting point metal which could be used? Can you advise of a good process to make such banks?—W.H.M.

The commonly used process for making small numbers of such articles as these penny banks is slush casting. This process is a modification of permanent mold casting. Low melting point alloy, generally zinc base alloy similar to a die casting metal, is poured into steel or cast iron molds. When a skin about 1/16" to ¼" thick has formed, the residual molten alloy is poured out of the mold to leave a hollow part. If the mold is carefully made the castings need little or no buffing or polishing before they are surface finished. Almost any type of finish can be applied, certainly any finish which is suitable for zinc die castings can be used.—Ed.

CABLE CLAMPS

I have heard that some die caster is making a zinc die cast clamp to hold steel cables in reinforced concrete during the curing of the concrete.

We are interested in finding out more about this development. Can you tell us who is making the clamps?—C.R.M., market development.

This is a new one on us. We've heard of thousands of uses for zinc die castings but never this one. I suppose that these clamps are used in the manufacture of pre-stressed concrete structures. If so, it would seem like a natural for die castings. Possibly one of our readers knows about this development and will write us about it.—Ed.

Die Casting Costs Come Down Fast!

with Precision UN-BREAKABLE TEMPERED and TREATED

STAINLESS STEEL DIE CASTING PLUNGER RINGS

Precision Rings are revolutionizing costs in the die casting industry . . . and it's not difficult to understand why.

- Die casting machines can operate up to 8-10 times longer before plunger rings need replacing.
- Precision Rings absolutely will not break —reduce down time.
- Even tension permits a more effective seal against pressure loss—assures more perfect casts.
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Precision Die Casting Plunger Rings have become so successful in cost reduction that our reputation has become world-wide for the finest in Die Casting Plunger Rings.

Write today for more complete information. When ordering, give complete specifications for your machines and your problems.

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We make them all!

Now, *from stock*, you can obtain longer-lasting *steel* goosenecks* in nominal sleeve sizes for your die casting machines. Dodge goosenecks are machined and sleeved, ready for your use.

Shown here are just a few of the hundreds of Dodge *cast steel goosenecks* we have supplied to industry.

Select the one that fits your machine—then ask us for an eye-opening quotation! If your gooseneck isn't pictured here, ask. Chances are we've made it and it's available. Cast steel replacement parts, from pots to skimmers, are in stock, too.

Write us *today*. We'll be happy to furnish complete details, without obligation.

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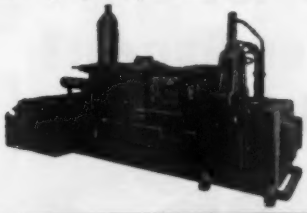
VICKERS HYDRAULIC EQUIPMENT

SIEMENS ELECTRICAL EQUIPMENT

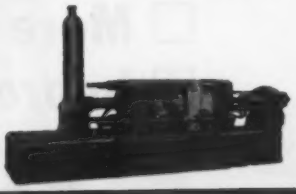
Model CASTMATIC Z/250
hot chamber type

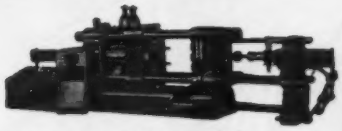
- Wedge Lock clamping system
- 275 U.S. tons locking force
- 13.2 lbs. Zinc alloy, max. casting weight
- 600 dry cycles per hour



Model CASTMATIC 150
cold chamber type

- Toggle clamping system
- 165 U.S. tons locking force
- 3 lbs. Aluminum alloy, max. casting weight
- 550 dry cycles per hour





Model CASTMATIC 700
cold chamber type

- Wedge clamping system
- Central screw for adjusting platen daylight
- 770 U.S. tons locking force
- 19 lbs. Aluminum alloy, max. casting weight
- 250-400 dry cycles per hour

TRIULZI

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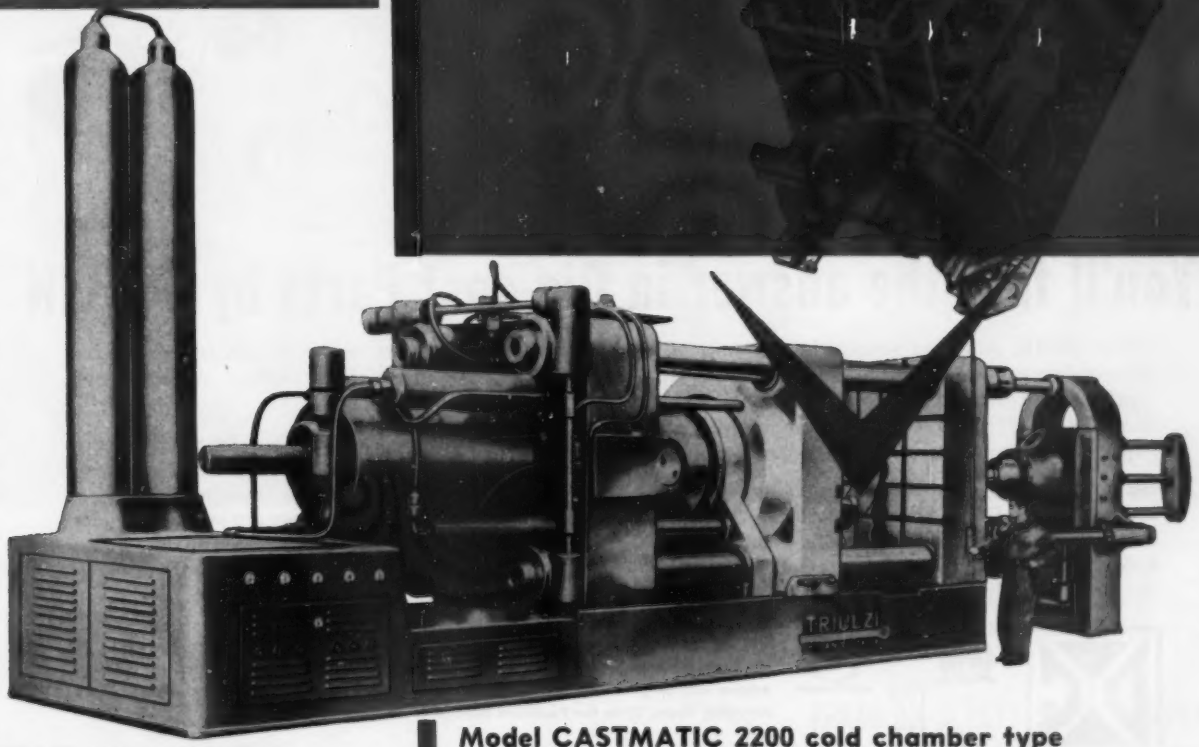

ALL TRIULZI MACHINES can be supplied with:

- Vacuum Equipment
- Automatic ladling

Model CASTMATIC 2200 cold chamber type

- Locked piston positive clamping system
- 2500 U.S. tons locking force
- 110 lbs. Aluminum alloy, max. casting weight
- 99" max. open platen daylight
- 59" moving platen stroke
- 79" x 83" platen dimensions

Visit us at the NATIONAL DIE CASTING EXPOSITION Detroit Artillery Armory Nov. 8-11, 1960 Stands No. 156-255

Circle No. 73 on Reader Service Card

Designing or Re-designing?

for ☐ Lower Costs?
☐ More Sales Appeal?
☐ Improved Quality?

You'll find the answer in Die-cast Parts by DOLLIN

LOWER COSTS! Amazing savings in piece costs—in secondary operations—in combining of parts—in finishing costs—in assembly costs are made by using DOLLIN die-cast zinc or aluminum parts in place of other methods. Let us show you examples.

SALES APPEAL! You can give your designs fullest latitude with DOLLIN Die-castings. Intricate exterior shapes and configurations—complex interior holes, bosses, studs, sections, wall thicknesses are automatically reproduced . . . all in one shot! Weight can be reduced—strength increased—the widest choice of plating, buffing, polishing and finishing may be applied.

IMPROVED QUALITY! Dollin Die-castings are carefully cast and checked for soundness of structure and dimensional accuracy. The metallurgy is always on-grade; zinc castings are produced under the C-Z Certified Zinc Alloy Plan—aluminum castings are spectographically checked and certified on request.

Get the most out of your die-casting designs by consulting DOLLIN engineers. Call in our local representative, or mail drawings and specs to us. Authoritative engineering advice will be given without cost or obligation, to improve designs and quality, while reducing costs. Write for Facilities Brochure.

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See "Yellow Pages" for nearest office.

DOLLIN Zinc & Aluminum DIE-CASTINGS

Circle No. 28 on Reader Service Card

ANNOUNCING A NEW VANADIUM-ALLOYS DEPARTMENT FOR TOOL AND SPECIAL STEELS IN

cast to shape FORM

A brand new, completely equipped department for Cast-to-Shape tool and special steels—conventional sand casting or precision casting by the Shaw Process or shell molding—varied melting furnace capacity of 30 pounds, 300 pounds, 1000 pounds and 2000 pounds for flexibility in the casting of special analyses with maximum economy and service to our customers.

STANDARD GRADES	FORMEX—a 5% chrome hot work die steel. AIREX—a 5% chrome cold work, air hardening die steel. CROMEX—a 12% chrome cold work die steel.
SPECIAL COMPOSITIONS	Available to customer specifications.
TYPICAL APPLICATIONS	Forming rolls, cams, drop forge trimming dies, forming or blanking dies, molds, draw rings.

For sound castings of closely controlled chemical analysis, and to insure uniformity in machining and heat treating, come to VANADIUM-ALLOYS STEEL COMPANY.

50th Anniversary

FIRST QUALITY · TOOL & SPECIAL STEELS · V·A · 1910-1960

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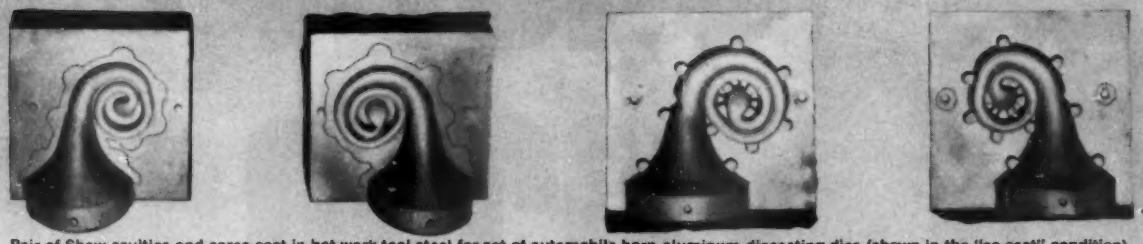
Circle No. 101 on Reader Service Card

THE SHAW PROCESS IS PLEASED TO PRESENT ITS NEW CERAMIC CASTING METHOD FOR THE DIE CASTING INDUSTRY

SHAW CAST TOOL STEEL DIE CASTING DIES



Pair of Shaw cavities and cores cast in hot work tool steel for set of automobile horn aluminum diecasting dies (shown in the "as-cast" condition).

For the first time, the Diecasting Industry can enjoy the advantages of producing its dies by this new casting process... a method of such precision that it exceeds machining in many cases. Having already been made and used by leading diecasters for several years, we can now announce that Shaw diecasting dies, cores and inserts, cast in the hot-work tool steels, have passed every critical test with flying colors. It is significant that only the Shaw Process, among all precision casting methods, has been able to satisfy the exacting demands of the diecasting diemaker. Below are some of the reasons:

Shaw Cast Diecasting Dies Actually Last Longer—The chill-cast, fine-grained smooth surface of the Shaw casting resists heat checking. The absence of tool marks eliminates dragging and abrasive wear. A one-piece casting, which would normally be made up of a number of inserts, eliminates flash traps.

Deliveries Are Much Shorter—Replacements Are Made Overnight—A simple aluminum, epoxy, or plaster pattern is first made, invested with slurry and cast. Once the pattern is completed, castings are often made overnight in H-11 & D-5 for zinc dies, H-13 for A1 & magnesium, H-21 for brass dies.

Die Costs are Often as much as 500% Lower—Even the most complicated forms are being cast in Shaw with less than a few hours labor involved after the pattern is completed. Savings are substantial. Complicated Shaw cast cavities have often been produced for less than the cost of the bar stock alone!

Higher Production With Fewer Rejects—The absence of insert flash traps, tool marks, and increased resistance to peening results in smooth operation, less down time, less die and ejector pin maintenance and fewer rejects. It has been found that the increase in the total number of good castings per day can be as high as 25%.

Better Finish—Producing a single Shaw casting to replace a group of small inserts eliminates hot spots and blistering...produces better thermal balance, results in finer plateable finish, sounder diecastings.

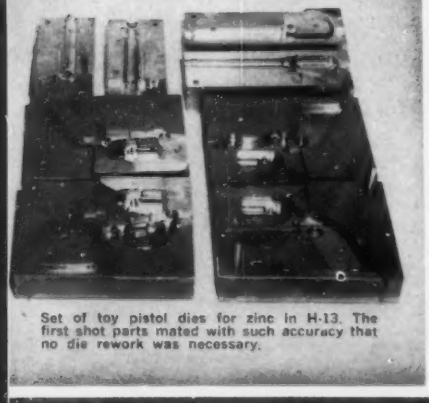
Rapid Replacement of Damaged, Worn Cavities, or for Engineering Changes—Damaged die components and sudden engineering changes can play havoc with production and delivery schedules. Keeping patterns on hand, Shaw replacement castings are obtained overnight.

Less Deformation in Heat Treatment—Since the fine-grained cast structure of the Shaw-cast die component has no directional grain, it is not subject to the stresses set up by machining a forged bar. There is less movement during heat treatment and little fitting is required in the heat treated stage. In the event frequent annealing and reheat treatment for welding or other modification becomes necessary, users have found that the Shaw Cast die component (with its non-directional isotropic grain structure) gives less distortion.

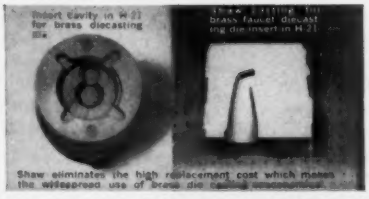
For a copy of the 56 page brochure describing the Shaw Process, write Dept. P-1

Shaw Process Development Corp., Division of British Industries Corporation, Port Washington, New York.

SHAW PROCESS



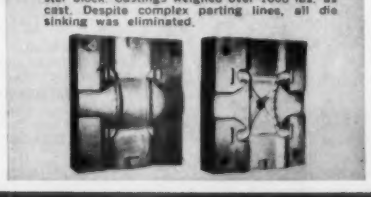
Set of toy pistol dies for zinc in H-13. The first shot parts mated with such accuracy that no die rework was necessary.



Insert cavity in H-21 for brass diecasting die.

Large brass faucet diecasting die insert in H-21.

Shaw eliminates the high replacement cost which makes the widespread use of brass die castings uneconomical.

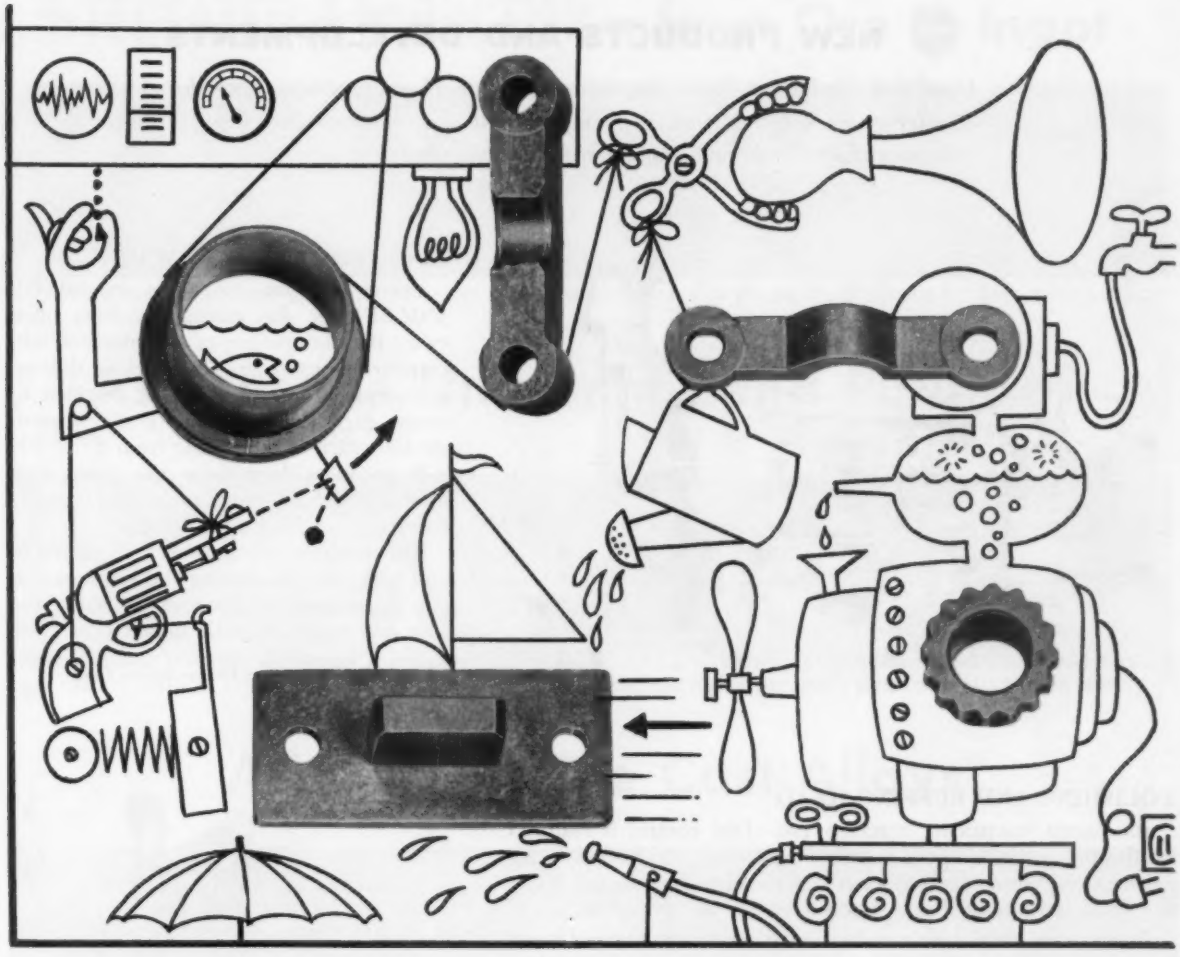


Large aluminum diecasting die including bolster block. Castings weighed over 1000 lbs. as cast. Despite complex parting lines, all die sinking was eliminated.

Other applications of the SHAW PROCESS

SHAW PROCESS
Division of British Industries Corp., Port Washington, New York.

You are cordially invited to see the Shaw Process, on display at Booth 513, Detroit Artillery Armory (Nov. 8-11) and Booth 344, Los Angeles Sports Arena (Nov. 14-18).



This thing wouldn't run when we plugged it in,

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You may find that metal powder parts similar to these, or perhaps in entirely different form, can mean substantial savings in manufacture of your products.

Glidden Resistox Metal Powders are prepared by a special process which removes *all* soluble salts, resulting in pure, stable powders for highest finish, appearance and performance characteristics.

Glidden is the world's largest blender and can produce up to 30,000 pounds of powder in a single batch —an important factor in complete uniformity of mass-produced parts.

As a leading supplier of metal powders, Glidden works closely with parts producers. This places the combined training and experience of several staffs of metallurgists and technicians at your disposal.

**Write on your letterhead for sample parts package and further information on powdered metal products.*

QUALITY Glidden PRODUCTS

RESISTOX METAL POWDERS

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COPPER POWDER • LEAD POWDER • TIN POWDER • BRASS POWDER • ALLOY POWDER • FILTER POWDER
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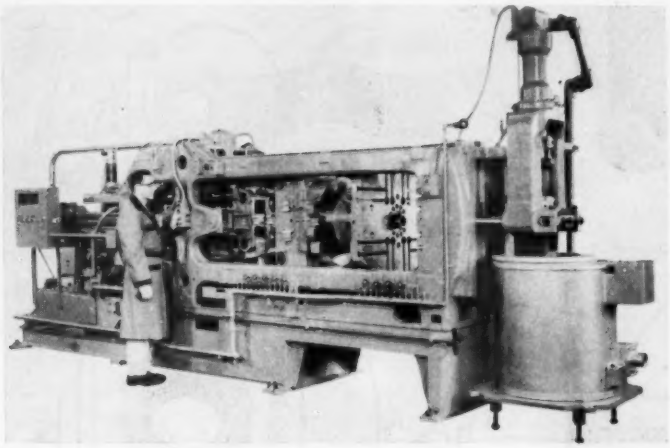
Circle No. 30 on Reader Service Card

NEW PRODUCTS AND DEVELOPMENTS

Qualified readers can get complete details on these products. Use the Reader Service Cards facing page 82. Information presented here is the manufacturers' own assessment of their products.



ZINC DIE CASTING MACHINE

LESTER-PHOENIX, INC.—The model HP-450Z-SF zinc die casting machine offers twice the die opening of any machine with comparable tonnage. The machine delivers a clamping force of 450 tons, certified by strain gage tests, and has a die opening stroke which is adjustable from 8" to 30".

It produces deep draw zinc parts, such as washing machine agitators and automotive trim, weighing up to 15¼ lbs.

The machine incorporates the Lester zinc end which is self-aligning and requires only one adjustment for final set-up. Shot pressure and speed are adjustable.

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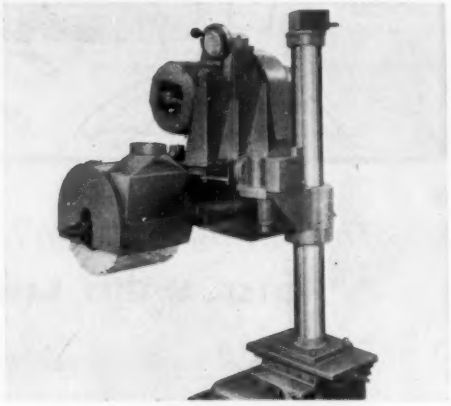
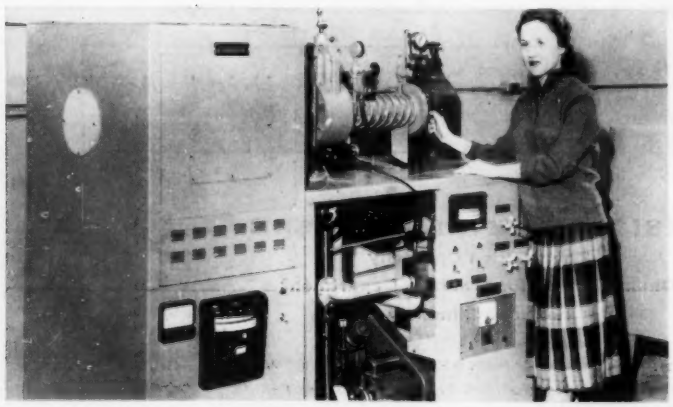
POLISHING AND BUFFING HEAD

HAMMOND MACHINERY BUILDERS, INC.—Dial control is featured on this new variable speed automatic polishing and buffing head. Dial control allows the proper wheel speed to be selected while the head is running. Various speed ranges are available.

Advantages offered by variable speed automatic polishing and buffing heads are: Wheel economy—as wheels wear, speed is increased, giving maximum production and wheel life. Increased production—the most efficient speed can be selected without stopping the head. Better finish—different materials require the different speeds available with this feature. Convenience—metal chart on the dial control indicates the right speed for each job.

Circle No. 236 on Reader Service Card





VACUUM FURNACE

LINDBERG ENGINEERING CO.—This new furnace is a self-contained, complete package unit for processing small parts in a vacuum or protective atmosphere.

The unit consists of a furnace equipped with all electrical components and automatic controller. A 4" I.D. special alloy retort for operation to 2250°F at a pressure level of 0.5 micron with water-jacketed cooling chamber, and a vacuum pumping system with all controls and vacuum gage are included.

Circle No. 237 on Reader Service Card

continued on page 64

INTEGRATED PRODUCTION—from Ore to Ingot

Underground scene in American Zinc's East Tennessee zinc mines. More than 50 years' reserve of zinc ore has been developed here.

Assures the Uniformity and Purity of

Cell room in American Zinc's electrolytic zinc plant at Monsanto, Ill. Special high-grade zinc is produced at this modern refinery.

AZCO Zinc Die Cast Alloys

Latest spectrographic analyzing equipment is employed to assure accurate control of alloys at all times.

You set your specification—get your specification with AZCO Zinc Die Cast Alloys. AZCO Alloys are produced from American Zinc special high-grade slab zinc—quality controlled from ore to ingot to assure the purity and uniform analysis you need for trouble-free production. From our Monsanto, Illinois, plant in the center of the "Zinc Zone," you get the fast, dependable service you need to meet your production schedules. Phone for immediate attention.

American Zinc sales company

1515 Paul Brown Building, St. Louis 1, Missouri

Distributors for:

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Circle No. 8 on Reader Service Card

No parts* failures in 5 years—
reports U. S. Electrical Motors Inc. to Asco Sintering Corporation

And the part to which they referred was the lock nut* on the main drive of the U. S. Varidrive Motor. This lock nut is manufactured for U. S. Motors by Asco Sintering Corporation of Los Angeles.

For 5 years, Bob Bowen, Asco's Production Manager, has relied on Hoeganaes MH-100 Iron Powder to give him trouble-free production. Mr. Bowen sums up the performance of Hoeganaes Sponge Iron Powders this way:

- *Good dimensional control.*
- *Good green and sintered strength.*
- *Uniformity from batch to batch.*
- *Good machinability.*

Your nearby Hoeganaes Service Engineer can acquaint you in more detail with the trouble-free performance factors that go hand-in-hand with Hoeganaes Powders. He's nearby and at your service.

Cross section view of U. S. Electrical Motor's Varidrive model. Arrow indicates lock nut manufactured by Asco Sintering Corporation, 7799 Telegraph Rd., Los Angeles, Calif.

H S I C

HOEGANAES

HOEGANAES SPONGE IRON CORPORATION

RIVERTON, NEW JERSEY

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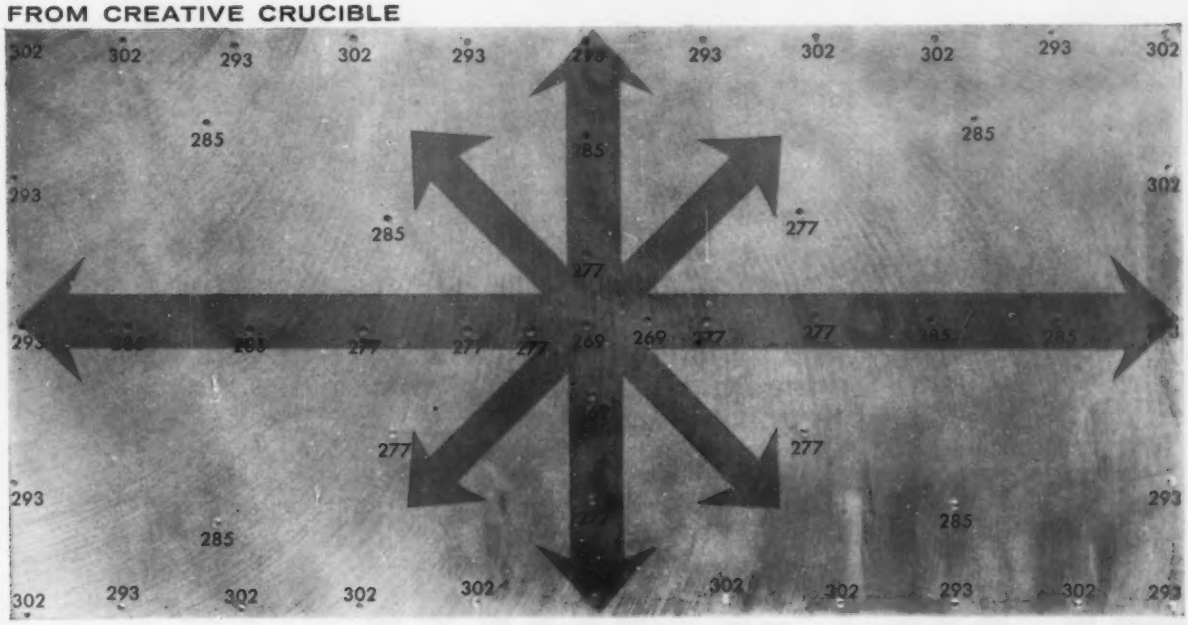
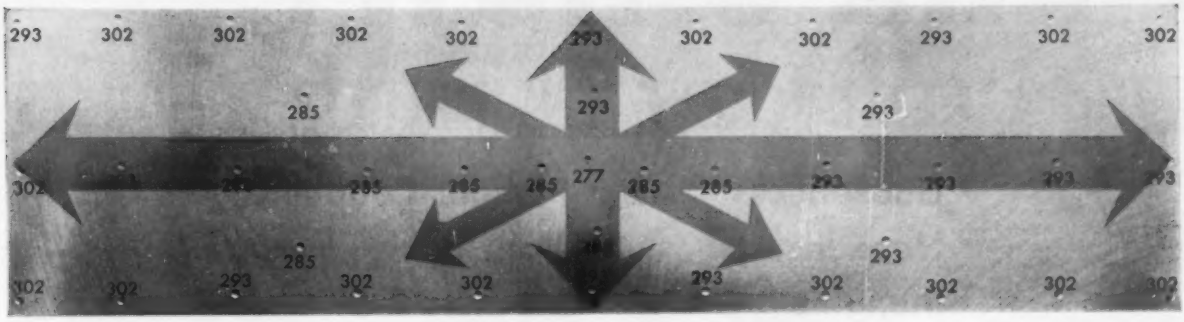
Circle No. 36 on Reader Service Card

FROM CREATIVE CRUCIBLE



20" x 10"



20" x 5"

CSM 2

with positive, high hardenability

Now you can make larger plastic molds and die casting dies—for longer runs—and get better finishes!

Notice the small hardness gradient—across the surface and from surface to center—of these typical blocks of prehardened CSM 2. This small gradient indicates the more uniform hardness of CSM 2—and assures you of at least 5 major benefits:

- more uniform polish from top to bottom of cavity
- greater resistance to washing at center or bottom of cavity
- more positive shut-off surface—particularly in internally landed molds and dies
- more uniform machining characteristics from top to center of cavity
- elimination of heat treatment of most plastic injection molds and zinc die casting dies in sections up to 14" to 15" thick.

Complete details on Crucible CSM 2—either prehardened or annealed—are readily available through local Crucible steel service centers. For data, call the center nearest you or write: *Crucible Steel Company of America, Dept. TI27, Pittsburgh 30, Pa.*

CRUCIBLE STEEL COMPANY OF AMERICA

Circle No. 22 on Reader Service Card

SINCE 1944

SERVING THE DIE CASTING INDUSTRY

with . . . a complete line of interchangeable replacement parts for the injection end of aluminum and zinc die casting machines.

HERE'S HOW!

REX-BUCKEYE ENGINEERED PRODUCTS

- Goosenecks
- Nose Inserts
- Plungers
- Piston Rings
- Plunger Tips
- Plunger Couplings
- Nozzles
- Machine & Breakdown Pots
- Shot Sleeves
- Plunger Rods
- Infra Red Die & Nozzle Heaters

Complete rework service on goosenecks, plungers, shot sleeves and plunger tips.

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FIRST NATIONAL DIE CASTING EXPOSITION & CONGRESS
Detroit Artillery Armory • **November 8-11, 1960**
BOOTH 317

R·B

For All Types & Sizes of Die Casting Machines

Rex-Buckeye Co.

Atlantic 1-6718
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Circle No. 109 on Reader Service Card

Unmatched purity and uniformity:

FEDERATED ZINC DIE CASTING ALLOYS

Completely controlled production provides you with die cast metals of highest purity and uniformity. Federated Zinc die cast metal is made from ASARCO Special High Grade Zinc, electrolytically refined by Asarco-developed processes. Production is concentrated "under one roof" at Corpus Christi, Texas, one of the world's largest plants producing Special High Grade zinc and die casting alloys. Strategically located warehouse stocks assure you of prompt volume delivery. For complete information about FEDERATED Zinc Die Casting Alloys, write or call: Federated Metals Division, American Smelting and Refining Company, 120 Broadway, New York 5, N. Y. or your nearby Federated sales office.

ASARCO

AMERICAN SMELTING AND REFINING COMPANY

Low machining costs, superior castability, and an excellent plating surface are the big reasons why zinc die castings are favored for fuel pumps, carburetors, grilles, lamp housing, instrument panels, horn rings, and many other functional and decorative automotive components.

FEDERATED METALS DIVISION

Where to call for information:

ALTON, ILLINOIS
Alton: Howard 5-2511
St. Louis: Jackson 4-4040

BALTIMORE, MARYLAND
Orleans 5-2400

BIRMINGHAM, ALA.
Fairfax 2-1802

BOSTON 16, MASS.
Liberty 2-0797

CHICAGO, ILL. (WHITING)
Chicago: Essex 5-5000
Whiting: Whiting 826

CINCINNATI, OHIO
Cherry 1-1678

CLEVELAND, OHIO
Prospect 1-2175

DALLAS, TEXAS
Adams 5-5034

DETROIT 2, MICHIGAN
Trinity 1-5040

EL PASO, TEXAS
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3-1852

HOUSTON 29, TEXAS
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MILWAUKEE 10, WIS.
Hilltop 5-7430

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Locust 7-5129

PITTSBURGH 24, PENNA.
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PORTLAND 9, OREGON
Capitol 7-1404

ROCHESTER 4, NEW YORK
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ST. LOUIS, MISSOURI
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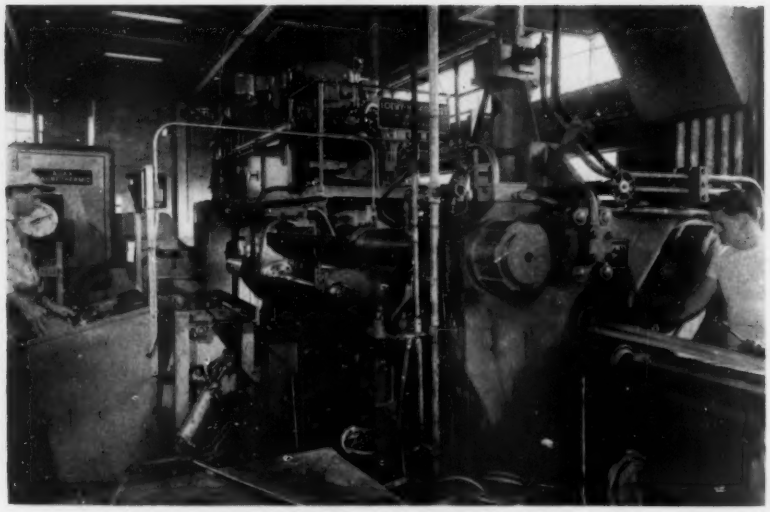
NEWS OF INDUSTRY & ASSOCIATIONS

activities of people, companies & groups in the precision metal molding industries

ENTERS CUSTOM EXTRUSIONS FIELD



Pittsburgh Aluminum Alloys, Inc. has entered the custom aluminum extrusion field with the installation of this 1500-ton Loewy extrusion press. Custom extrusion service will be sold nationally by Pittsburgh Aluminum Alloy's own sales representatives. For the past 15 years the firm produced aluminum extrusions for its own door and window products under the name of B & G Mfg. Co.

COPPER AWARDS

The Copper & Brass Research Association has launched its Third Annual competition to honor the year's most outstanding contributions to advancing the use of copper and its alloys. This year the Association will award first prizes in two separate categories so that equal recognition will be given to the best industrial and architectural applications of copper, brass, bronze, or other copper-base alloys.

Winner in each category will receive $500 and a bronze trophy to be presented at the Association's annual meeting in Hot Springs, Va. next May. Members of the copper and brass industry are not eligible for the awards, but they may nominate other firms or individuals.

Entries for the award may be new or redesigned products, or contributions to copper research.

STOKES OFFERS LAB

Metal working firms wanting to investigate vacuum heat-treating, brazing, high-temperature sintering, or casting before making a commitment for capital investment now are able to do so.

Special laboratory facilities recently established in Philadelphia by the Vacuum Metallurgical Dept. of F. J. Stokes Corp. are offered for these purposes at modest fees.

Universities conducting research in solid-state physics or the properties of high-temperature metals and ceramics can also use the facilities for some of their experimental work. In so doing they will become more familiar with the latest developments in the application of vacuum.

Three standard design vacuum furnaces and pilot scale equipment are available in the new laboratory. Included is a heat-treating furnace which can operate at 4000°F.

HAYES NAMES ASHTON

ASHTON

C. I. Hayes, Inc., has announced the appointment of Stewart B. Ashton as chief engineer. In his new position, Ashton will be concerned with the design, development and engineering of atmosphere generating equipment, drying, and purifying units.

Ashton formerly was chief development engineer for the E.S.I. Bridgeport Laboratories. He majored in mechanical engineering at Brown University and also studied at the Franklin Institute.

WILSON APPOINTED

WILSON

Howard F. Wilson has been named plant manager by Aluminum Extrusions, Inc. He will be responsible for all phases of manufacturing.

Wilson formerly was manager of the Wire-Wrap Div. of the Gardner-Denver Co.

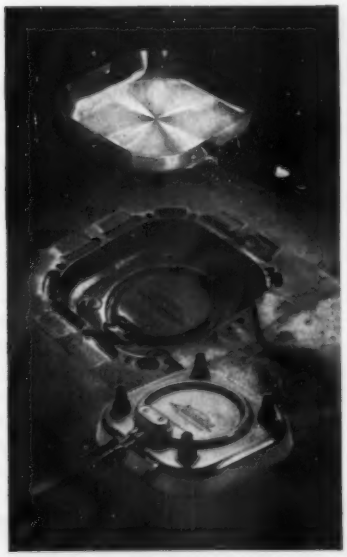
more industry news on page 98

Helpful Hints for Die Casters

—from Bethlehem's Tool Steel Engineer

Air Quenching Improves Service Life of Hot-Work Tools

The majority of hot-work tool steels can be hardened by quenching in oil or air. Because of greater convenience in handling, as well as to avoid excessive scaling, many hot-work tools are quenched in oil. However, it is better practice to use air-quenching because air-quenched tools have lower residual stresses than tools which have been liquid-quenched. Failures caused by heat checking are the direct result of surface stresses produced in service, so it's desirable to minimize residual stresses in the tool itself which can lead to premature failure. Tools which have low residual stresses are best suited for long service life on hot-work applications. That's why air-quenching is generally best for hot-work tools.



Why Cromo-High V Tool Steel Is Ideal for Die Casters

Bethlehem Cromo-High V is a reliable performer in die casting aluminum-base or magnesium-base alloys at 1200-1300 F. Having a 5 pct chrome, high-vanadium content, Cromo-High V comes annealed to Brinell 207, for easy machining. It resists heat-checks. And it develops uniform hardness in large sections during heat-treatment, enabling it to resist wash and erosion. For full particulars, get in touch with your Bethlehem tool steel distributor.

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BETHLEHEM STEEL

BETHLEHEM STEEL

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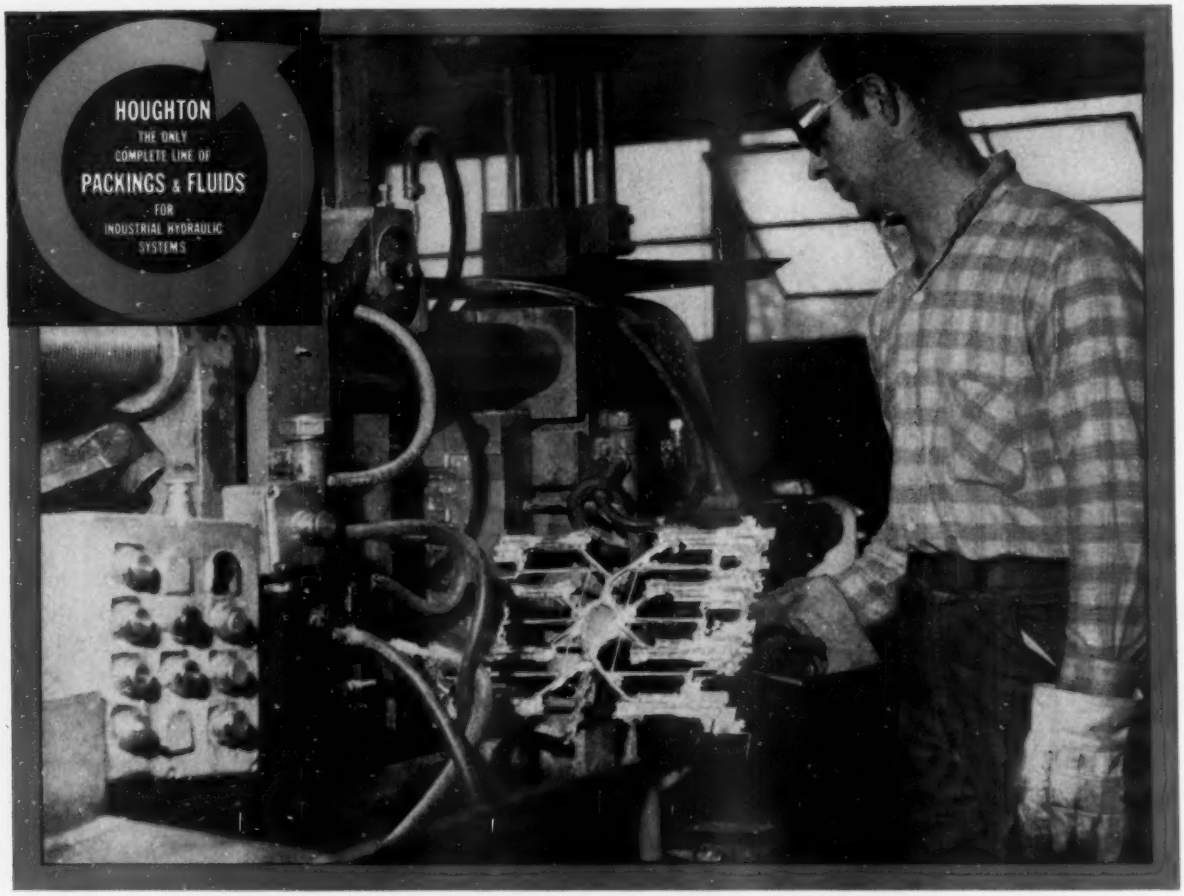

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a lesson in safe hydraulic fluid economy

Since 1954, four 400-ton die casting machines like this one operated continuously on *their initial fill* of Houghto-Safe Hydraulic Fluids. Only make-up was needed to maintain proper fluid level. And each machine operated more than 3000 hours every year.

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Houghto-Safe *fortified* fluids can give your hydraulic equipment and plants this same economical protection. And with it you get completely unbiased hydraulic service from the only manufacturer who offers three types of fire-resistant fluids (Water-Glycol, Phosphate-Ester and Emulsion Types) with compatible packings for any industrial hydraulic service.

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small
or
large

in any metal--ferrous or non-ferrous, including magnesium
in any quantity--production or prototype

Arwood's casting facilities enable us to cast parts that range from a fraction of an ounce up to 100 pounds. You now have a single source for small and large castings. It's just another good reason for doing business with Arwood.

- Five production plants throughout the country.
- Complete design, tooling and metallurgical research facilities.
- Eighteen years' experience in casting *all* the metals and alloys that can be poured into a mold – including everything from magnesium right through to stainless steel and difficult-to-machine superalloys.
- A time-tested record for reliability in meeting quoted prices and scheduled deliveries.
- Seventy-one trained engineering representatives coast to coast.

So . . . when the specifications call for an investment casting, you'll find that it pays to get a quote from Arwood.

Like to know more about investment casting? Send for our 44-page "Practical Guide to Investment Casting." It's yours for the asking.

Machine the simple . . . cast the complex

A complete service from design through tooling, production and finish machining. Seventy-one engineering representatives from coast to coast.

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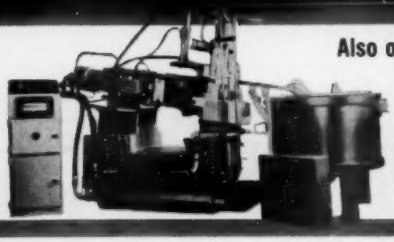
GOING TO THE SHOW?

Then be sure to see the DCMT display of small die casting machines, featuring the new modular MAC 99, described below.



Also on display, the revolutionary

DCMT RAM

FULLY AUTOMATIC,

which averages 1500 shots per hour . . . **requires no operator!** 60 ton lock, 1 lb. capacity.

DCMT MAC 99

Automatic Cycling Die Casting Machine

15 Ton • 1 lb. capacity

FIRST TIME...

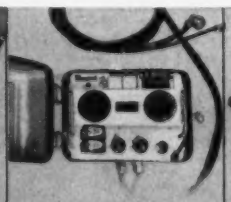
a basic modular Die Casting Machine with plug-in accessories, available at your option for utmost flexibility and efficiency!

FEATURES: push button panel (see below) • **90° convertible die unit** and **removable spacer plate** (see below) • **broader and huskier base** for greater stability and less vibration • **new solenoid-operated valve system** with **speed control** for die setting and shockless cycling • **exhaust mufflers** for quiet operation • Optional features: **electronic timer unit** (see below) for automatic cycling • **a brush device** mounted over the dies, cleans and lubricates the die faces (see below).

B.I.C. ENDORSED QUALITY

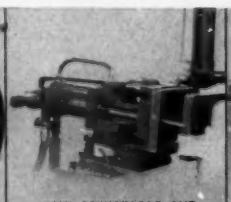
PUSH BUTTON PANEL

Mounted on side of machine away from die parting line. Push buttons for manual cycle and for automatic single cycle. Electrically interlocked for safety.



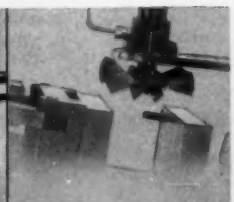
ELECTRONIC TIMER UNIT

Entirely enclosed in a metal container. Can be attached instantly to the control panel with quick-connect pluga, and be placed away from machine.



4-WAY ADJUSTABLE AND REMOVABLE DIE UNIT

Can be adjusted with tie bars horizontally or vertically. Spacer plate is removed for center gating. These four adjustments provide greater die setting flexibility.



BRUSH DEVICE

Mounted over the dies. Cleans and lubricates the die faces. Phosphor bronze brushes placed in segments for desired adjustment and easy replacement.

BOOTH 513

Detroit Artillery Armory
November 8-11
(National Die Casting Exposition and Congress)

BOOTH 344

Los Angeles Sports Arena
November 14-18
(ASTE Western Tool Show)

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Q. WHAT FIRE-RESISTANT HYDRAULIC FLUID SHOULD YOU USE?

UCON hydrolubes are the economical answer for fire-resistance in hydraulic fluids. Extensive field tests and more than 10 years of routine use in industrial hydraulic equipment have proven the safety and economy of UCON hydrolubes. And, UCON hydrolubes are approved for use by Factory Mutual Laboratories.

• UCON hydrolubes have better viscosity-temperature properties than the phosphate-ester fluids, that cost as much as 40 per cent more. UCON hydrolubes are shear-stable. And, they have none of the harmful effects on packings and seals that the phosphate-esters exhibit.

• UCON hydrolubes provide maximum protection against liquid and vapor phase corrosion, and have outstanding anti-wear characteristics. Thus, pump replacement costs are held to a minimum. Cheaper water-in-oil emulsions have poor emulsion stability. In addition, water-in-oil emulsions lose fire-resistant properties and give inadequate lubrication.

• Most hydraulic systems can be quickly and easily converted to fire-resistant UCON hydrolubes. Standard flushing and refilling procedures, involving a minimum of time and effort are sufficient. In many instances, reduced leakage losses have been reported.

Remember—UCON hydrolubes are the economical answer for fire-resistance in hydraulic fluids. Replacement is quick and easy and loss is low.

Get all the facts on UCON hydrolubes in the booklet, "UCON Hydrolubes Spell Safety." For a copy, ask a CARBIDE Technical Representative, or write Union Carbide Chemicals Company, Division of Union Carbide Corporation, Department J2, 270 Park Avenue, New York 17, N.Y.

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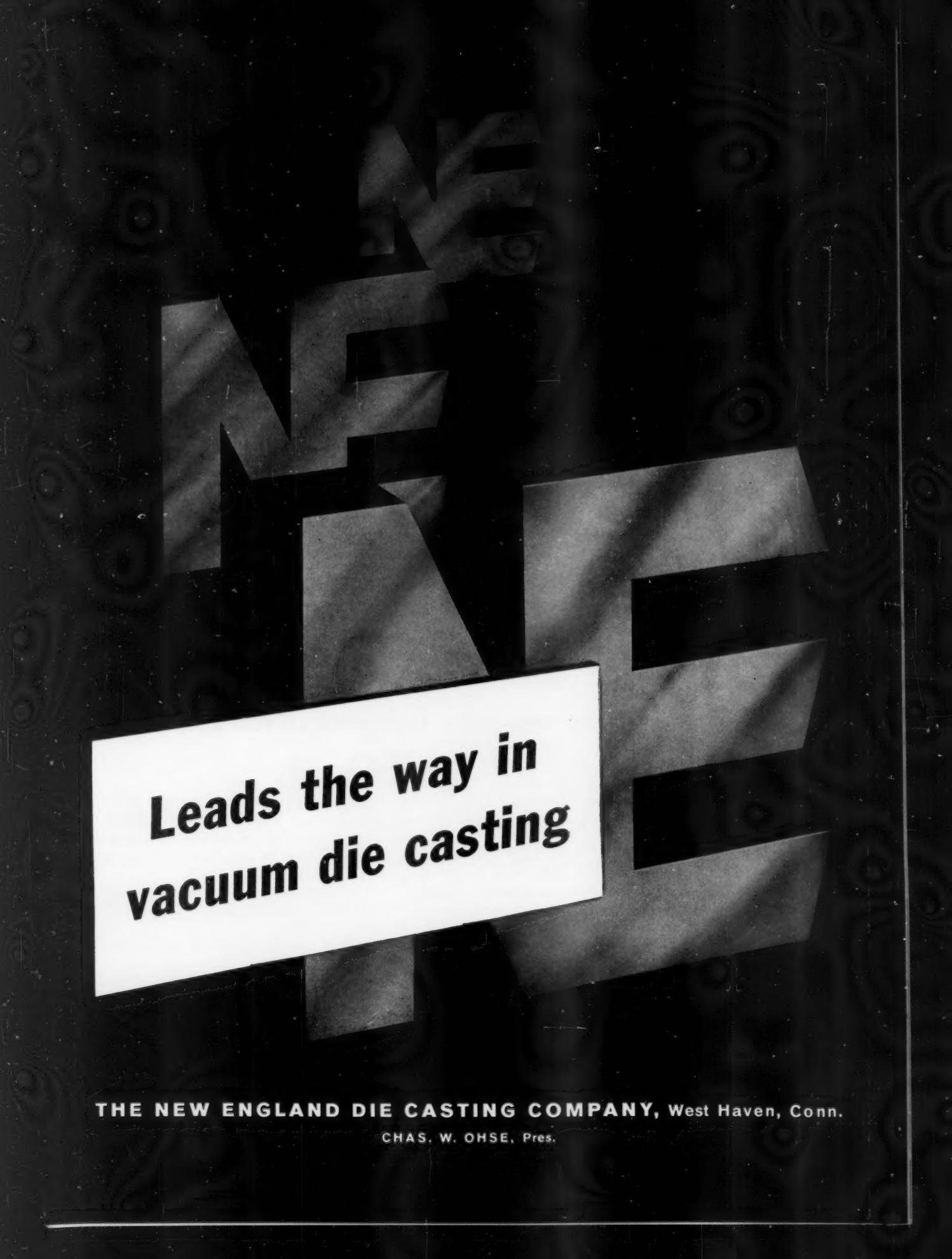


THE NEW ENGLAND DIE CASTING COMPANY, West Haven, Conn.

CHAS. W. OHSE, Pres.

CAREFUL part design held the tool costs on this carburetor body low

BASIC DIE DESIGN CONSIDERATIONS

and their effect on part design

By NORMAN G. LEACH, *Norman Leach Associates, Toledo, Ohio*

THE PURPOSE of this article is to cite, from the authors experience, a few of the basic design considerations that can result in good die construction and lower die costs. Keep in mind that certain designs, because of the nature of the part or its application, have inherent limitations or exceptions to the considerations given here. The degree of simplicity or complexity of a die cast die is determined by the number of variables. A few of the most important variables to be discussed are the number of cavities, gate location, die size, cooling and ejection.

NUMBER OF CAVITIES

The first question that arises is, "What are the production requirements for this casting?" This will, in many cases, determine whether we will have a single or multiple cavity die or a combination die. The difference between them is that the multiple cavity die is used for casting several parts of the same shape and are usually confined to small parts to be produced in large quantity. The combination die is used for castings that are of different shape. (See Fig. 1) The number of cavities in the combination die are often limited, while a greater number are usually incorporated in a multiple cavity die. The size of the casting may limit the die to just one cavity. This condition may require more than one die to produce the production requirements.

GATE LOCATION

The location of the gate is a very important factor in the proper functioning of the die. The metal should flow smoothly around bosses and projections and into the ribs. In the area where gases are most

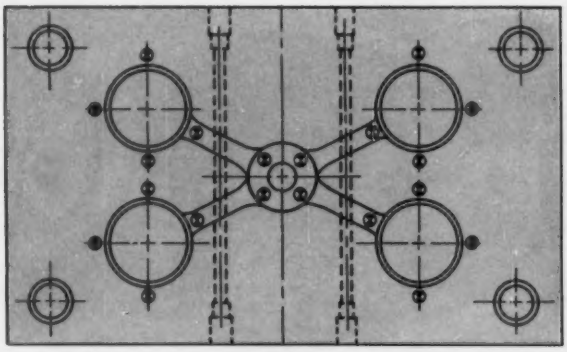
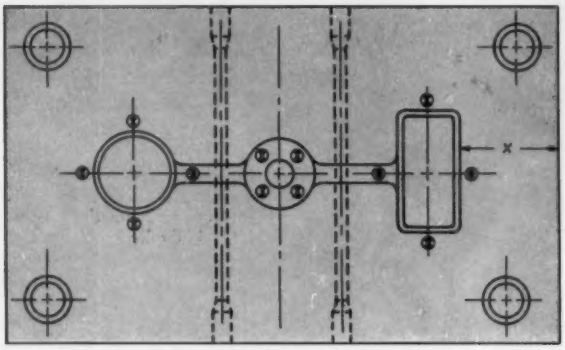


FIG. 1 MULTIPLE CAVITY DIE (above), combination cavity (below).



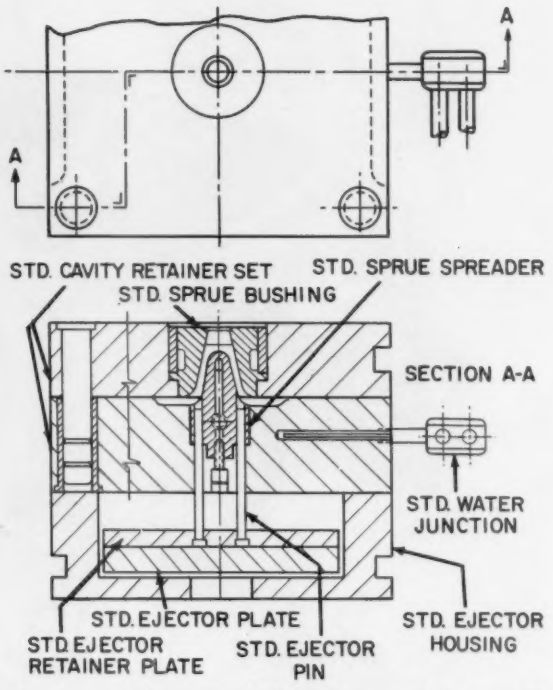


FIG. 2 STANDARD DIE SETS should be used when possible to lower construction costs.

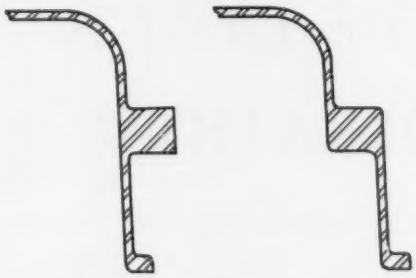


FIG. 1a REDESIGN when converting from sand casting.

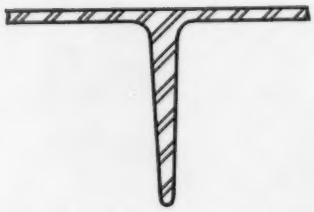


FIG. 2a LARGE RADII will reduce cooling stresses.

apt to be trapped, an overflow or vent is located to exhaust the majority of this air and gas.

DIE SIZE

The area from the cavity to the edge of the die is called "seal" (see X in Fig. 1) and must be maintained to prevent the molten metal that is forced into the die under pressure from flashing between the two die halves. This distance is usually 3 to 4 inches on small dies and increases proportionately with the size of the die.

The tendency to cut down on steel size is not a practical method for reducing die cost, because this may cause a number of problems, such as warping in heat treatment and lack of space for the water lines to cool the die. The thickness of the die blocks depends on whether a solid impression block will be used or whether cavities are to be inserted.

COOLING

Sprue spreaders and sprue bushings should be water cooled. Large cores and slides cut in the solid should have internal water lines, particularly in aluminum dies where higher temperatures are common. On dies with inserted cavities and cores, each

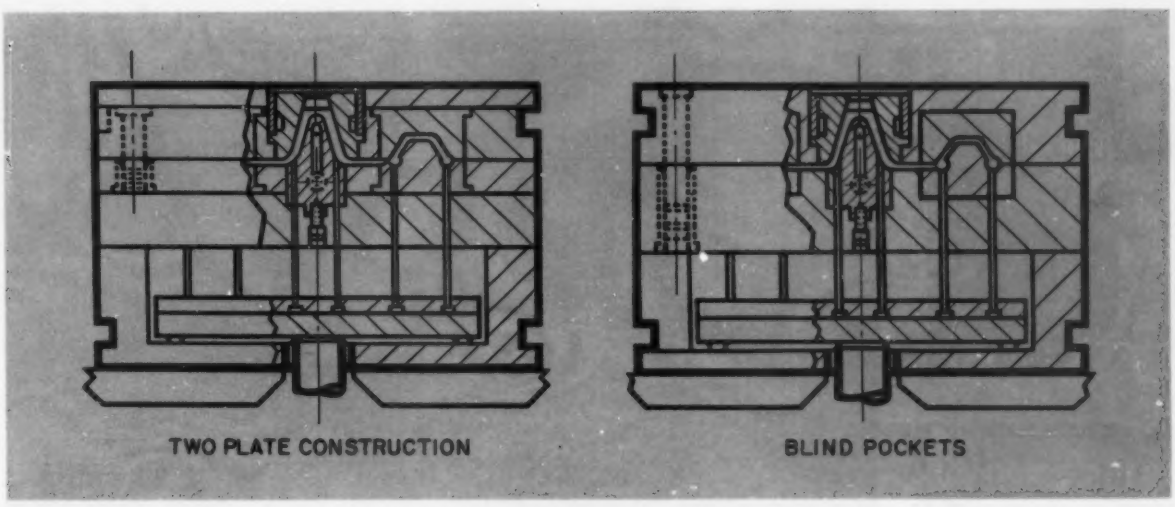


FIG. 3 TWO PLATE die construction (left)is less costly than blind pocket construction (right).

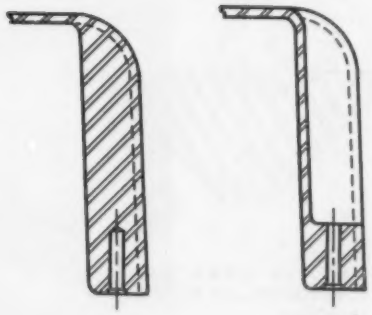


FIG. 3a HEAVY BOSSES tend to give porosity, avoid them when possible.

insert should be cooled separately whenever possible. Water lines under or over inserts will cool the main die blocks, but heat transmission between insert and die block is very small and so it is difficult to maintain adequate temperature control.

EJECTION CONSIDERATIONS

An adequate amount of ejector pins, which is determined by the shape of the casting, should be installed in the die. This is an important factor that can eliminate distortion of the part as it is ejected from the die. The casters requirements usually determine the type of ejection method to be employed. Ejector sleeves beneath bosses should be avoided if possible, because of the maintenance problems involved in the running of the die. However, many castings require this method of ejection due to the design characteristics of the part.

REDUCING DIE COSTS

The continuing increase in die costs has been a constant problem in die casting. Although every die has its peculiar considerations that make a specific discussion of die cost reduction impossible, there are some specific considerations that are instrumental in keeping die costs down. These considerations are:

1. Use of Standard Die Components–Cavity Retainer Sets, Sprue Bushing Spreader, Ejector Pins and Plates, Dowels and Bushings. (see Fig. 2)
2. Insert Cavities vs. Solid Impression Block–insert cavities are used instead of cutting impression into solid block when Ejector half of impression extends above the parting line and when heat treatment is required.
3. Two-plate vs. Blind Pockets–(see Fig. 3) the Two-plate construction is used to save time by being able to saw or bore completely through the two halves of the die blocks.

One of the methods developed to reduce die costs is the use of the Unit Die technique. A Unit Die has a common supporting assembly, called a holder unit, that contains the sprue spreader and bushing when used for zinc and a shot sleeve hole when used for aluminum or magnesium. The unit holder is gated to distribute the metal to each of the replacement units from a single gate opening. Each replacement unit has its own ejector mechanism so that the unit may be quickly and easily removed and replaced without interrupting the casting operation for more than twenty or thirty minutes.

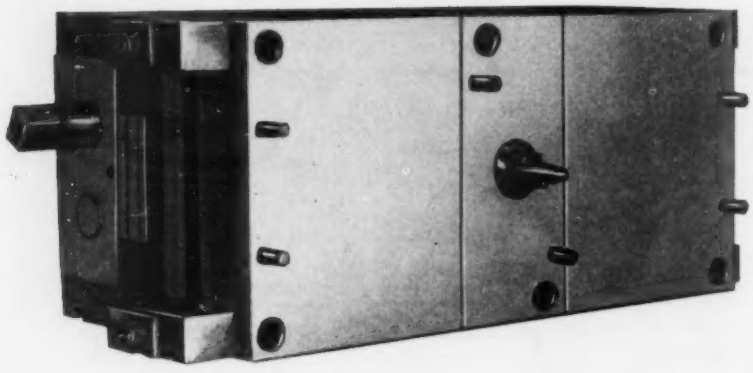
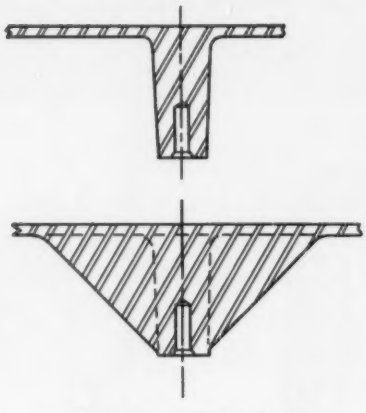


FIG. 4 STANDARD DIE SETS are used to mount unit dies. They are reusable units if desired.



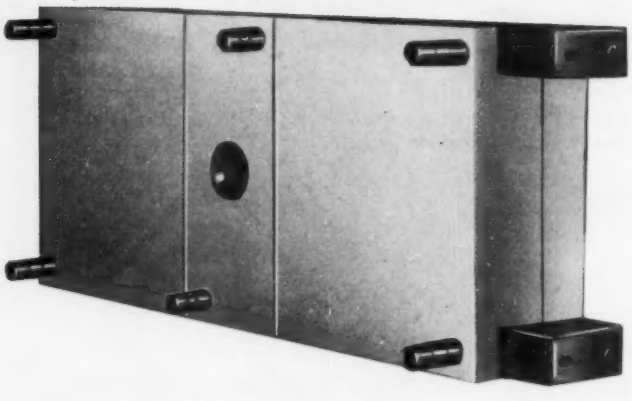


FIG. 4a RIBS ADD STRENGTH and improve metal flow.

One of the most prominent types of Unit Dies is one that incorporates Standard components throughout the assembly. This type of Unit Die Holder, (see Fig. 4) enables the use of three sides of each replacement unit for placing of cores or water lines. The use of wedge clamps located over the leader pin location permits a maximum of cavity area for a wider range of jobs.

Round Unit Holder (see Fig. 5) round units are also used in holding dies, but are more limited or restricted, due to the possible use of core pulls at right angles to each other. Fig. 4 shows a Holding Die with 3 round Units and 1 elongated Unit with 2 Unit Dies in the Unit Holder.

Two important factors govern the design of die cast parts, economy of production and quality. Almost any part can be cast with necessary changes if it is within the dimensional and weight limits of existing commercial die casting machines. If a part originally designed for a sand casting would be produced as a die casting without suitable changes the result would be higher die costs and reduced strength.

The part will be cast in two halves of a die and must be drawn out after the molten metal has solidified. Therefore if the part is anchored by projection or depression this area must be removed by the addition of a slide or core which will increase die costs. (see Fig. 1a)

A line at which the two halves meet is called a parting line and is one of the first steps to consider in designing or modifying a design for die casting. This can be determined by the die designer so that the casting can be produced and trimmed more economically. A flat or straight parting line is always preferable since the casting and trimming die can be built easier and costs less to maintain.

The thickness of a wall or section is determined by the general shape and size of the casting and the mechanical strength requirements. A section is generally made as thin as possible, but of sufficient thickness to ensure complete filling of the die. In most cases a small casting can be cast in thinner sections than larger castings.

Whenever possible wall thickness should be uni-

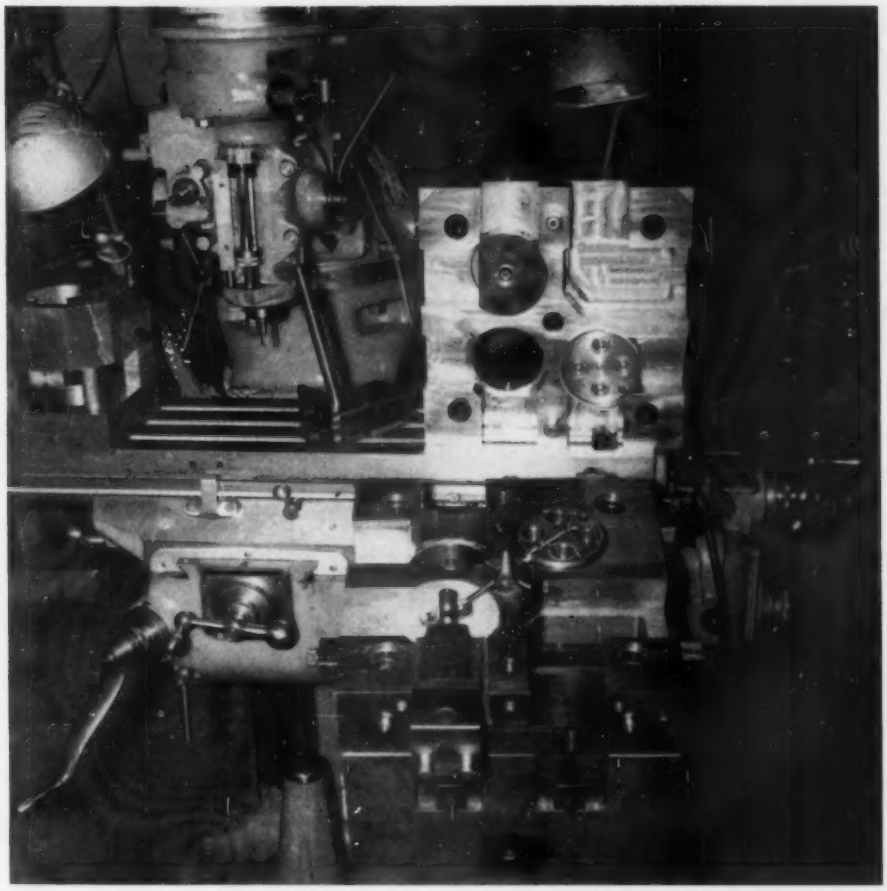


FIG. 5 LESS FLEXIBLE, round die holders are still less expensive than multiple cavities in a solid block.

form throughout the casting. Thin sections will cool more rapidly than heavier ones so at the intersection joint of unequal sections, shrinkage stresses will develop. A radius at this joint tends to make the change more gradual (see Fig. 2a).

Heavy bosses should be avoided and if possible relieved by coring (see Fig. 3a). This fact must be kept in mind because porosity becomes greater in heavy sections.

Ribs are also added to walls and deep bosses to create strength and rigidity and to allow the metal to flow into these cavities readily (see Fig. 4a).

Whenever possible all ribs, bosses and areas where the metal will shrink should be in the ejector half of the die so that the casting will not stick to the cover half.

Draft of both cover and ejector half of the part should be considered. Zinc does not require as much draft as aluminum and should not be less than 1 degree except in cases where special provision has been made to eject the part from the die or remove this area by means of movable slide or core. Aluminum usually requires 2 degrees draft whenever possible because of the soldering or sticking tendencies of this metal.

Whenever possible ejector pin bosses should be added to the casting to facilitate the removal of the part from the ejector half of the die. The bosses should be located in the areas where the most shrinkage is likely to occur since they will strengthen the part being cast.

It is not the intent of this article to answer all of the questions concerning the reduction of die costs or the simplification of die design. Every casting has its individual design characteristics that must be considered in the general overall picture.

The majority of die cast designers are very open-minded. They are constantly striving to inject new ideas into their die designs . . . . . in order to reduce machining of the castings, lower the cost of the die and their maintenance and to improve the quality of the casting being produced. The designer should, therefore, take advantage of every offer of assistance from his supplier. It will pay off in lower costs.

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Two important factors govern the design of die cast parts, economy of production and quality. Almost any part can be cast with necessary changes if it is within the dimensional and weight limits of existing commercial die casting machines. If a part originally designed for a sand casting would be produced as a die casting without suitable changes the result would be higher die costs and reduced strength.

The part will be cast in two halves of a die and must be drawn out after the molten metal has solidified. Therefore if the part is anchored by projection or depression this area must be removed by the addition of a slide or core which will increase die costs. (see Fig. 1a)

A line at which the two halves meet is called a parting line and is one of the first steps to consider in designing or modifying a design for die casting. This can be determined by the die designer so that the casting can be produced and trimmed more economically. A flat or straight parting line is always preferable since the casting and trimming die can be built easier and costs less to maintain.

The thickness of a wall or section is determined by the general shape and size of the casting and the mechanical strength requirements. A section is generally made as thin as possible, but of sufficient thickness to ensure complete filling of the die. In most cases a small casting can be cast in thinner sections than larger castings.

Whenever possible wall thickness should be uni-

WHY SWITCH TO FIRE-RESISTANT HYDRAULIC FLUIDS

By DALE F. SMITH, *Sales Engineer Monsanto Chemical Company*

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"Both vane and piston pumps have held up very well on die casting machines operated with synthetic fluid since 1950," said Gene Weinmann, Carter's General Superintendent over Die Casting, Machine Shop and Tool Room Departments. "Working 15 to 21 shifts a week, we have averaged not more than three pump failures a year."

The firm now has 19 Lester-Phoenix die-casting machines and 31 Clevelands. All of the Lesters have operated on phosphate ester type fluids and at first six Clevelands were switched to synthetic fluid. The conversion of the rest was completed December 31, 1959.

The Lester machines have piston pumps and operate at 1500-2800 psi. to cast aluminum, at 1200 degrees. Closing pressure is 600 tons. The Cleveland machines have vane pumps and operate at 1000 psi. Most are

"Now, if a line breaks and an operator gets soaked, he gets mad. But, we don't have a serious injury."

Despite the success of the change from a personnel point of view, Carter has been dissatisfied with pump life on units not using phosphate ester type fluids, Weinmann said. "In 1958, 62 pumps failed, an average life of less than six months each. This, coupled with the introduction of lower-priced Pydraul A-200 and our success in conquering fluid loss, impelled us to convert all our machines to Pydraul last year."

"We've been using A-200 as additional fluid is needed," Weinmann explained. "It mixes perfectly with F-9, and no conversion is required.

"However, we do a complete conversion job on the machines as we switch them to Pydraul. I imagine a basic change-over could be accomplished in three or four hours, but we put our machines out of service for two days and really work them over," he declared.

The conversion program embraces three things, according to John V. Lammers, plant engineer:

form throughout the casting. Thin sections will cool more rapidly than heavier ones so at the intersection joint of unequal sections, shrinkage stresses will develop. A radius at this joint tends to make the change more gradual (see Fig. 2a).

Heavy bosses should be avoided and if possible relieved by coring (see Fig. 3a). This fact must be kept in mind because porosity becomes greater in heavy sections.

Ribs are also added to walls and deep bosses to create strength and rigidity and to allow the metal to flow into these cavities readily (see Fig. 4a).

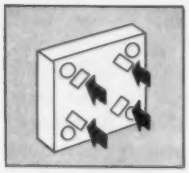
Whenever possible all ribs, bosses and areas where the metal will shrink should be in the ejector half of the die so that the casting will not stick to the cover half.

Draft of both cover and ejector half of the part should be considered. Zinc does not require as much draft as aluminum and should not be less than 1 degree except in cases where special provision has been made to eject the part from the die or remove this area by means of movable slide or core. Aluminum usually requires 2 degrees draft whenever possible because of the soldering or sticking tendencies of this metal.

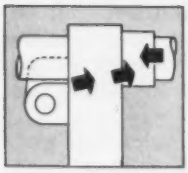
Whenever possible ejector pin bosses should be added to the casting to facilitate the removal of the part from the ejector half of the die. The bosses should be located in the areas where the most shrinkage is likely to occur since they will strengthen the part being cast.

It is not the intent of this article to answer all of the questions concerning the reduction of die costs or the simplification of die design. Every casting has its individual design characteristics that must be considered in the general overall picture.

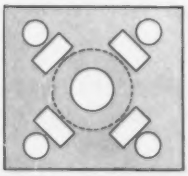
The majority of die cast designers are very open-minded. They are constantly striving to inject new ideas into their die designs . . . . . in order to reduce machining of the castings, lower the cost of the die and their maintenance and to improve the quality of the casting being produced. The designer should, therefore, take advantage of every offer of assistance from his supplier. It will pay off in lower costs.



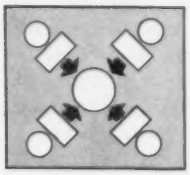
1. Each corner link is a strong, self-contained support for both plate and die.



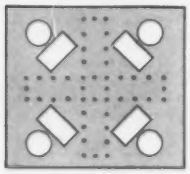
2. Short and direct transfer of loads on each corner minimizes bending stresses on the moving die platen and back plate.



3. Reduces the area of unsupported moving die plate. Helps eliminate flashing and potential cracking of dies.



4. Prevents weaving of the link center axis (crosshead) and consequent unequal loading.

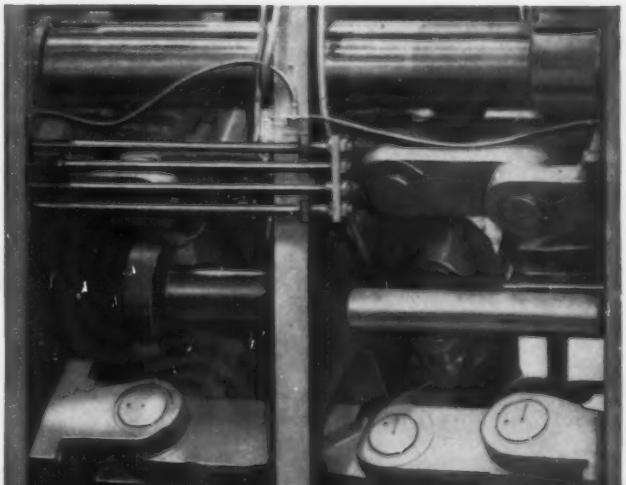


5. Permits a large area of both horizontal and vertical bumper pin ejection pattern.

6. Corner positioning of

FOUR-CORNER LOCK-UP

in Greenlee–B&T die casting machines offers you 7 benefits



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The Lester machines have piston pumps and operate at 1500-2800 psi. to cast aluminum, at 1200 degrees. Closing pressure is 600 tons. The Cleveland machines have vane pumps and operate at 1000 psi. Most are used for casting zinc, at 750 degrees. Closing pressure is 400 tons.

"From the time of our original conversion to fire-resistant fluids, we used Pydraul F-9, in the piston pumps," Weinmann said. "It scored best in a series of 'torture tests' we conducted at that time with a pump, a 50-gallon drum, pressure relief valve, thermometer, etc. But we had a fluid-loss problem with some machines, so we used a less expensive fluid.

"Our prime objective was to convert all of our die-casting machines to fire-resistant fluids," Weinmann explained. "We had experienced several small fires started by oil escaping from the hydraulic systems of the machines, but none had been really major. Production shut-downs had occurred, but not for any length of time. Several men had been injured in separate fires, but none really seriously. In short, we had been lucky, but felt that our luck might run out.

In a die-casting operation fire hazards are numerous, of course. There are gas-fired melting furnaces and holding furnaces supplied by a bull ladle. The natural gas torches used to heat the dies added to the danger.

"With petroleum oil, even a pin-hole leak in a line could spray a flammable stream 40 feet and start a fire. There was always that fear in the men's minds," Weinmann said. "Fire-resistant fluids have made a world of difference in their morale and efficiency.

"Now, if a line breaks and an operator gets soaked, he gets mad. But, we don't have a serious injury."

Despite the success of the change from a personnel point of view, Carter has been dissatisfied with pump life on units not using phosphate ester type fluids, Weinmann said. "In 1958, 62 pumps failed, an average life of less than six months each. This, coupled with the introduction of lower-priced Pydraul A-200 and our success in conquering fluid loss, impelled us to convert all our machines to Pydraul last year."

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The conversion program embraces three things, according to John V. Lammers, plant engineer:

1. The minor changes necessary to use the fluid;
2. A completion of the modifications that have greatly reduced fluid losses;
3. A general overhaul, including replacement or rebuilding of many component parts, so Carter will have accurate records on the life of the equipment on the new fluid.

The machines are disassembled and steam cleaned. All bent tubing is replaced with heavy-duty steel pipe or flared tubing. The latter has played a major role in reducing fluid loss because it eliminates threaded fittings, often a source of leaks.

"Flared tubing also cuts labor and material costs," said Lammers. "With threaded fittings, we used litharge and glycerine for pipe dope. It got so hard that disassembly was difficult, or impossible, and we sometimes had to junk the fittings."

All component parts in the pumps are replaced, as are all rings in the hydraulic cylinders. The cylinders, too, are either honed or replaced.

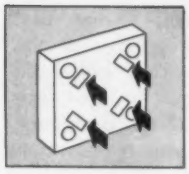
The machines are levelled, and all seals are replaced with those made of butyl which is resistant to Pydraul.

"Actually, we only need to replace dynamic seals to convert, but we feel it would be a foolish economy not to renew them all as long as the machine is down,"

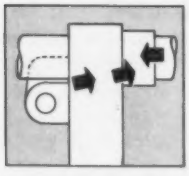
continued on page 99

FOUR-CORNER LOCK-UP

in Greenlee–B&T die casting machines offers you 7 benefits



1. Each corner link is a strong, self-contained support for both plate and die.



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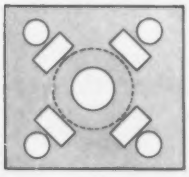

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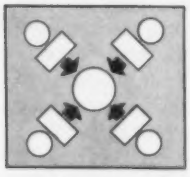

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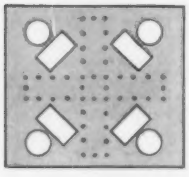
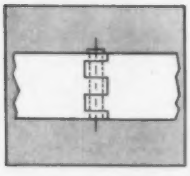
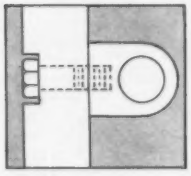


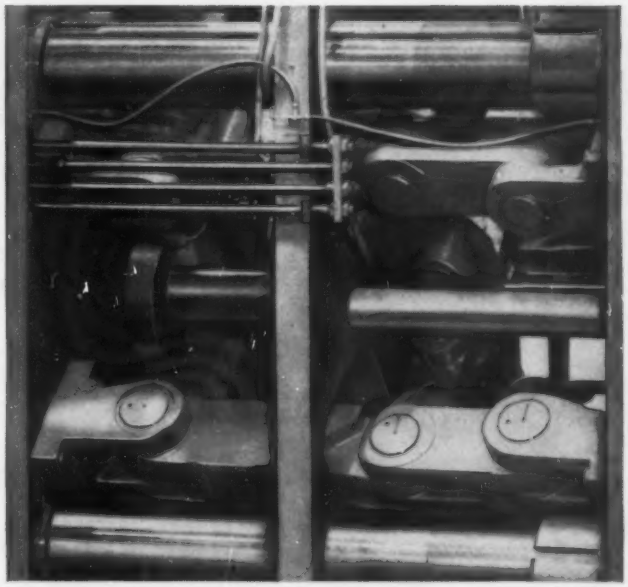
5. Permits a large area of both horizontal and vertical bumper pin ejection pattern.



6. Corner positioning of each link assembly results in equal and straight line loading of all pins and bearings in the link pivots.



7. Toggle anchors are bolted to the back and traveling platens. They are not subject to weld breaks or breakage as part of a casting.



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NOTES ON TRIM DIE DESIGN

as they affect casting design

By MERRITT LOE, *Foreman, Tool Dept., Schultz Die Casting Co.*

Editor's note: Most design engineers realize that they must have a good working knowledge of the die casting process, or must consult with a skilled die caster during design, if they are to get the best possible casting at the lowest cost. Many designers, however, do not realize that the trimming operation can be just as difficult and costly.

It does no good to design a part which can be cast to close tolerances, with a good surface finish, and with thin walls if the trimming operation is so difficult that the advantages gained in casting are lost in trimming.

The following notes on trim die design will give both a rudimentary knowledge of trim die design and emphasize that the trimming operation must be considered when the casting is designed.

All contract die casters are as skilled in the design of trim dies as they are in other phases of the die casting art. The designer should utilize this knowledge.

THERE ARE A FEW fundamental trim die designs. A fair knowledge of these is necessary before a successful design can be gotten. There are, of course, an endless number of variations and combinations of these designs, but remember—these designs are basic and almost all trim dies are simply variations.

The type of trim die selected will be determined by the particular casting and its specifications.

PINCH TRIM DIES

In the case of a casting with a 0.050 to 0.060 wall and a contour similar to that shown in Fig. 1 together with a gate feeder of 0.030 to 0.040, this type of trim is indicated.

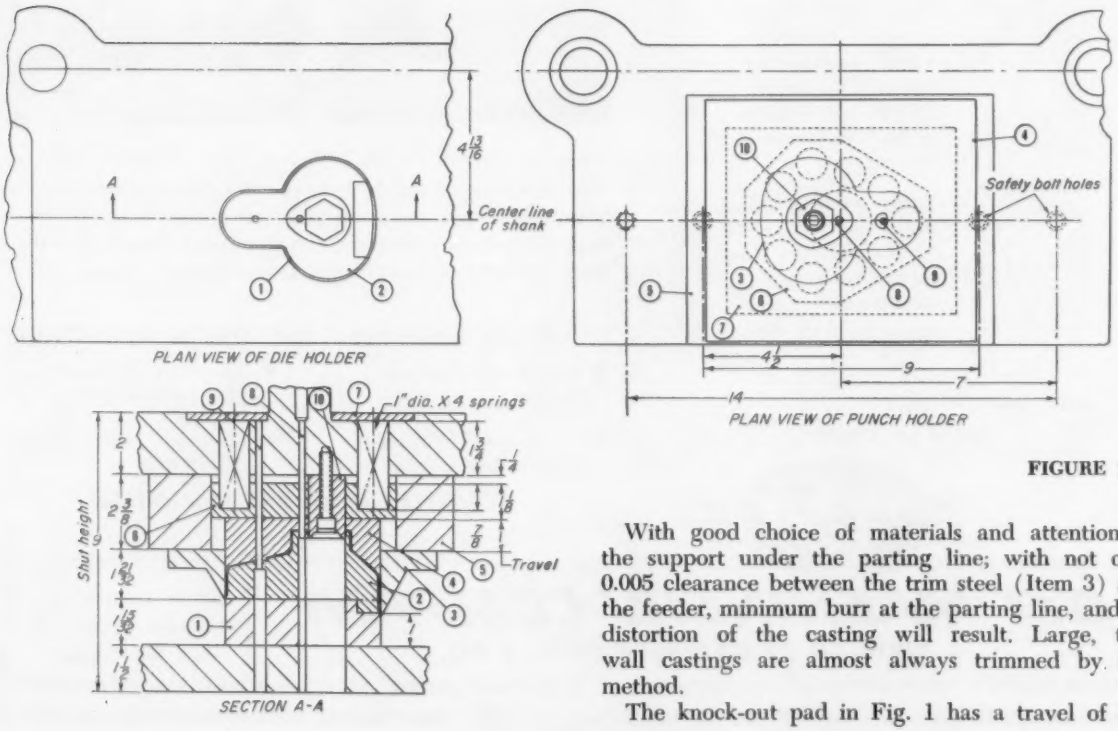


FIGURE 1

With good choice of materials and attention to the support under the parting line; with not over 0.005 clearance between the trim steel (Item 3) and the feeder, minimum burr at the parting line, and no distortion of the casting will result. Large, thin wall castings are almost always trimmed by this method.

The knock-out pad in Fig. 1 has a travel of one

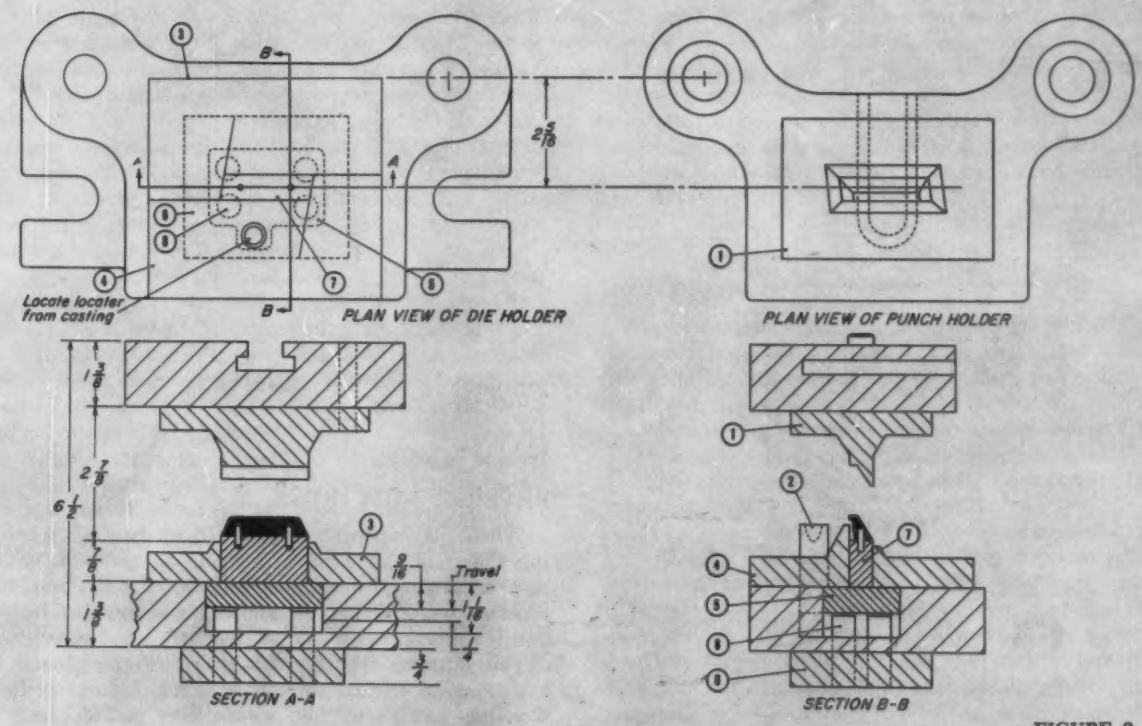


FIGURE 2

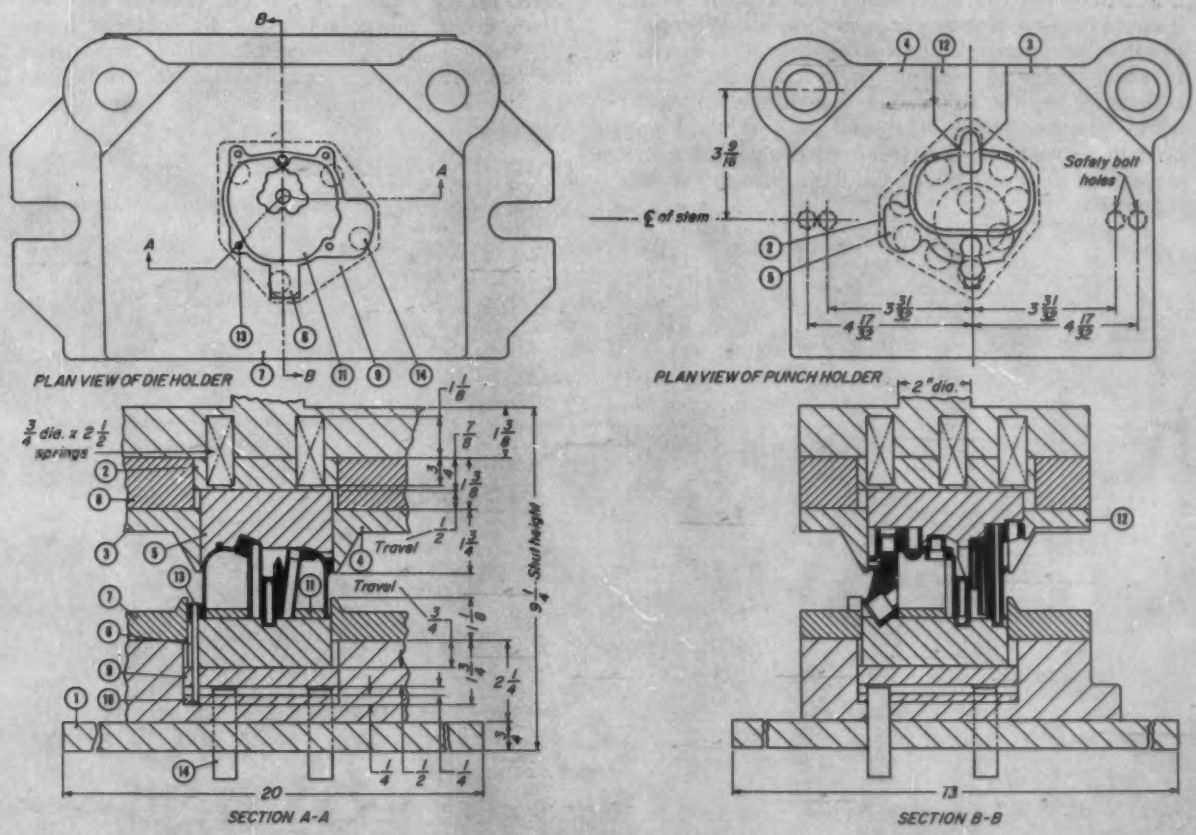
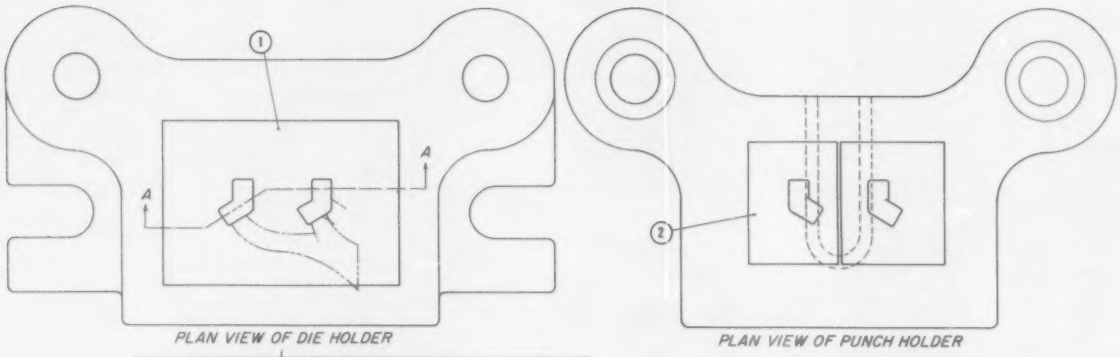


FIGURE 3



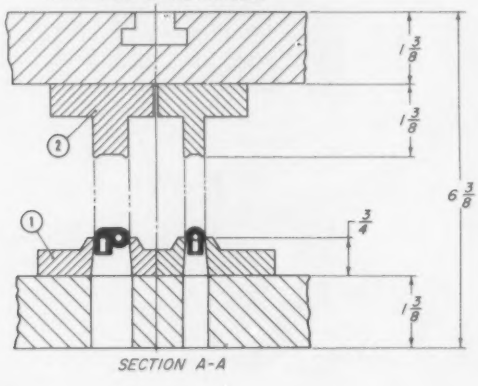


FIGURE 4

inch. This assures that the casting is seated in position before the trim steel can reach a point where it could cause a nick or gouge in the wall. Wherever possible, this principle should be observed, especially when designing multiple cavity trim dies where bent gates are the rule rather than the exception.

The punches (Items 8, 9, and 10) in Fig. 1 are used to remove the flash from cored holes. It is always good design to punch the flash through the die if possible.

REVERSE TRIM DIES

When the casting wall is 0.075 or over, or where the shape of the casting presents no problem with respect to support at the trim line, it is best to reverse the direction of trim. This eliminates burrs and breakouts.

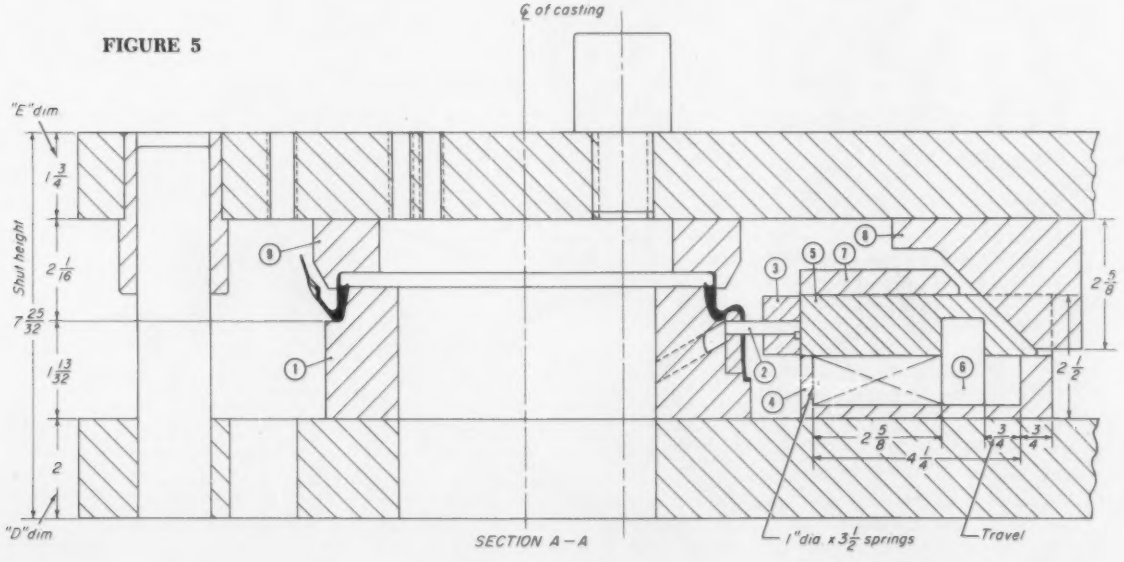
The cost of this type of trim die is generally low because critical support under the parting line is reduced. This method also allows greater design freedom.

The basic design for reverse trim is shown in Fig. 2. Note that the movable knock-out pad also serves as the locator. A good fit between the heel (Item 5) and the pocket in the die holder is essential. There is also a locating post which travels with the pad. The post is machined to receive a boss cast on the gate runner to assist in accurate positioning of the casting.

COMPOUND TRIM DIES

When a casting is formed by slides, complicated

FIGURE 5



parting lines result. To trim, a compound die must be used. Such a die is shown in Fig. 3. Both halves of the die contain moving pads, trim steels, etc.

In operation, enough pressure is applied to the pressure pins (Item 14) through the use of rubber, air, or other methods, to overcome the pressure in the top half, the trim pressure, plus the spring pressure needed to operate the knock-out pad. This forces the pad to retract and complete the top trim before the lower pad begins to move.

As soon as the top pad reaches home it forms, in effect, a solid die which forces the casting into the lower trim steels. This completes the trim job.

Note that the lower pad has a ¼" clearance and never seats solidly. This prevents damage to the press or to the die. This clearance can be provided at either the top or bottom pad.

When a striking, or coining, operation is needed then both pads can be driven home, but the die must be specially constructed for this operation.

DROP THROUGH DIES

This is the last distinct die type to be considered. It has the advantages of low cost and simplicity of design. The disadvantages are the probability of causing nicks and scratches on the casting surfaces. When the casting is to be plated this will require extra polishing and buffing which will increase costs too much.

In general this type of die is suited to castings which are to have a commercial finish and are of mechanical design rather than ornamental.

Drop through dies are especially valuable when trimming small multiple cavity castings where no holes are to be opened. The individual impressions can be automatically separated by dropping them into separate chutes so that they can be loaded directly into shipping cartons.

The simplest form of drop through dies is shown in Fig. 4.

SECONDARY OPERATIONS

Some secondary operations can be performed by the trimming dies. In many cases these operations can simplify the casting dies and the entire casting operation.

Curling and piercing operations are shown in Fig. 5 and multiple piercing operations are shown in Fig. 6. These are typical operations easily done during the trimming step.

Many variations of the basic designs treated here are possible. The combination of two or more types is also common.

Generally, the design of trimming dies follows sheet metal die practice. If, however, attention is given to trimming at the time the part is first designed it is generally true that tooling costs and trimming costs can be lowered. In some cases the casting dies will cost less and the casting operation proceed more rapidly and smoothly.

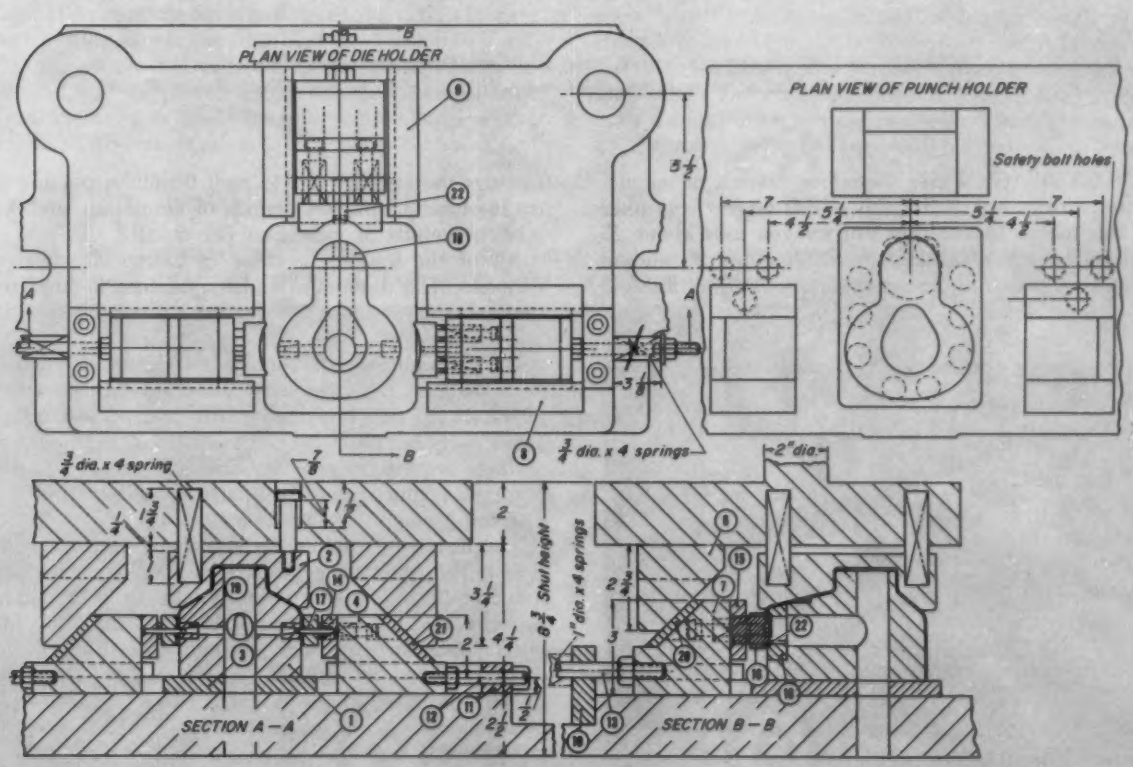
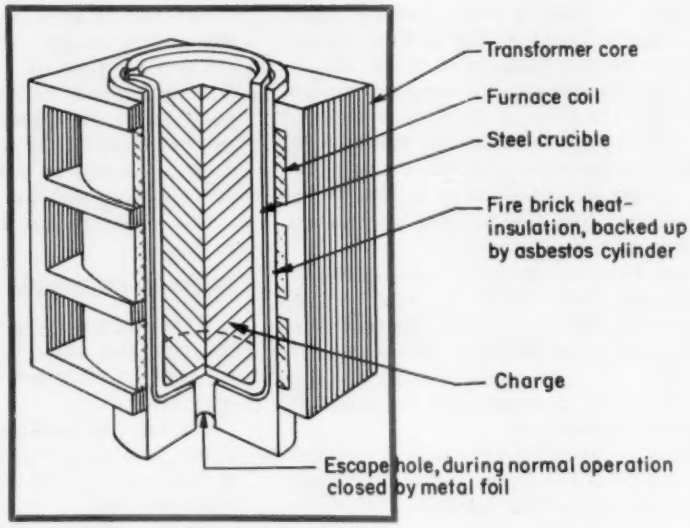


FIGURE 6


Transformer core
Furnace coil
Steel crucible
Fire brick heat-insulation, backed up by asbestos cylinder
Charge
Escape hole, during normal operation closed by metal foil

PRINCIPLE of the coreless line frequency induction furnace.

METAL MELTING PRACTICES AT VOLKSWAGEN

PART I Melting and Casting Magnesium

By GUENTHER SERWE, *chief engineer, Volkswagen foundries*
K. H. BROKMEIER, *chief engineer, Induction Furnace Div., Brown Boveri & Cie. AG*

VOLKSWAGEN uses 45 million pounds of magnesium castings a year. It's the worlds largest consumer of this metal. In addition Volkswagen uses about 25 million pounds of aluminum castings and 30 million pounds of gray iron. To get these quantities of finished castings the foundry has to melt 6 million pounds of magnesium, 3.5 million pounds of aluminum, and 4.4 million pounds of gray iron per month.

MAGNESIUM MELTING installation at the Volkswagen plant in Wolfsburg.

All of the melting is done in electrically heated furnaces. The aluminum and magnesium in line frequency coreless induction furnaces, the gray iron in arc furnaces.

On each automobile there are 41.2 lb. of magnesium castings; right and left hand crankshaft housings weigh 22 lb., gear housing 10.2 lb., and miscellaneous small parts for these housings 8.9 lb. The aluminum castings are the cylinder head which weighs 10.7 lb. (two per engine), and small parts which weigh 0.9 lb. The total weight of aluminum castings is 22.3 lb.

The line-up of melting, holding, and casting facilities at the Wolfsburg plant uses 23 line frequency induction furnaces rated 450KW, 1300 lb. crucible capacity, and a melting rate of 1800 lb./hr. The holding furnaces are resistance heated, 77 with 900 lb. capacity and rated at 31.5KW each, also 20 with 380 lb. capacity rated at 24KW each. These furnaces supply metal to 58 die casting machines which vary in size from 110 tons locking pressure to 880 tons locking pressure.

THE MELTING INSTALLATION

The furnaces use steel crucibles. They operate directly from the distribution system at line frequency.

The current flowing through the furnace coils generates a magnetic field, 85% of the energy is absorbed by the crucible and is dissipated as heat. The balance of energy from the magnetic field results in heat induced directly into the charge. As soon as the magnesium is melted the magnetic forces produce a stirring action which improves the heat transfer from the crucible into the charge.

The stirring action accelerates the heat transfer enough so that melting times are from 30 to 50 minutes. This is 15-25% of the melting times obtained with fuel-fired furnaces. This type furnace combines the advantages of short melting time and moderate stirring action even at line frequency. In practice the steel crucible induction furnace results in a minimum loss of metal due to oxidation.

The temperature of the crucible is determined by the balance between the heat transferred from the crucible into the charge. This balance depends on the amount of metal available in the crucible at any given time.

The energy transfer in an induction furnace is due to the electromagnetic field. This is supplied by a capacitor bank. The kVAR requirement of the furnace depends on the instantaneous condition of the electric circuit. The condition of the electric circuit is influenced to a great extent by the instantaneous temperature of the crucible which has an effect on its magnetic properties. With a cold crucible the kVAR requirement is small while with a hot crucible it is large. If a capacitor bank having a fixed rating is used the resulting power factor with a cold crucible is 0.7 leading, with a hot crucible 0.7 lagging. This wide fluctuation of the power factor is unacceptable in most cases. Provision is made for automatic control of the actual kVAR rating of the capacitors by means of automatic switching in line with the crucible temperature. It so happens, however, that the fluctuation of the power factor just described is acceptable to Volkswagen at Wolfsburg. Therefore, no automatic switching is provided. The same is not true in a new Volkswagen foundry using 12 induction furnaces because, unlike at Wolfsburg, power is purchased from a local utility rather than generated in the company's power plant.

The furnace proper is tiltable by means of hydraulic cylinders provided for the purpose. The furnace is designed in such a manner that the functional part consisting of the steel crucible together with the core and coils, all mounted on an integral frame, can be replaced easily and rapidly.

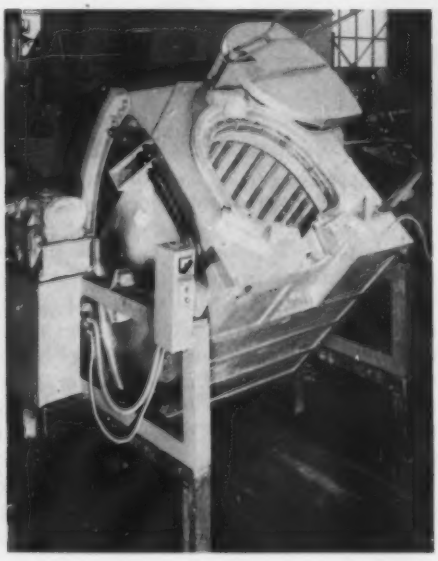
To furnish an idea of the physical size of such a unit, the crucible of 1300 lbs. capacity has an inside diameter of 23⅜ inches and a depth of 63 inches. The crucible weight is 4000 lbs.

The line frequency coreless induction furnaces are laid out in Wolfsburg in groups of three to four adjacent units.

The furnaces are used in three-shift operation. Melting is continuous. A molten heel of 450 lbs. is used, 900 lbs. are transferred to the crucible of the holding furnace. After each shift the crucible of the induction furnace is emptied and the residue of refining salts removed. The melting time for a charge of 900 lbs. is 25 to 30 minutes depending on the condition of the crucible. The mechanical forces which are responsible for the stirring action also cause bulging of the hot crucible. This is so quite simply because the energy induced into the crucible proper is six times higher than the energy induced into the charge. It follows that each crucible must be remachined after about 500 charges to avoid contact between its outer surface and the inner surface of the furnace protective lining behind which the coils are located.

As a rule during normal production magnesium ingots, returns, rejects, chips and briquettes are used

POURING MAGNESIUM from a melting furnace into a holding furnace and right, a typical holding furnace for magnesium.



for melting. Flux is added during melting to cover the surface of the charge.

For technical reasons refining is done in the holding rather than the melting furnace. To reduce the exposure of molten magnesium to the atmosphere, magnesium is poured from the melting furnace directly into the crucible of the holding furnace. The crucible of the holding furnace is removed for the purpose.

REFINING AND POURING

Molten magnesium is transferred from each melting furnace to three or four holding furnaces which are located near the die casting machines. Most of the holding furnaces have a capacity of 900 lbs. with a few rated at 380 lbs. All have cast steel crucibles which can easily be removed with a crane.

All the holding furnaces have a motor-operated tilting mechanism and the crucible is designed in such a way that during tilting the surface of the bath does not change abruptly in area so that the integrity of the flux layer is safeguarded. There is a special spout to obtain poured metal from underneath the flux layer. The furnaces use an hydraulic tilting mechanism.

The different pouring sequence of the holding furnaces is best facilitated by a gear segment-type of tilting device. During the time that metal is being poured the holding furnace must remain in several tilting positions during intervals of equal length and the gear segment device provides reliable positioning of the furnace at the required angles along with controlled tilting speed. This design not only protects the bath surface but also prevents the stirring up of the refining salts which rest at the bottom of the crucible. The resulting ease and reliability of the refining process makes it possible to pour up to 90% of the charge without running the risk of contamination of the metal by the salts. Usually only 10% and at maximum no more than 15% of the metal becomes mixed with the salts and is left at the bottom of the crucible in the holding furnace. The crucible is cleaned periodically and the residue returned to the melting furnace for remelting. At the same time the crucible is replenished.

MANUAL pouring from a holding furnace into the die casting machine. This operation is to be mechanized.

DIE CASTING OPERATION

Development of cold chamber die casting machines for the production of magnesium was started at Wolfsburg in 1957 and permanent mold casting has now been entirely supplanted by the use of die casting machines.

Development is going on to automate the transfer of magnesium from the holding furnace to the die casting machine, which is now accomplished by hand ladling. The die casting machines are rated at 110, 220, 660 and 880 tons with an injection pressure of 6400 lbs. per square inch. Hourly production of castings is subject to the usual limitations of the die casting machine and the complexity of the piece itself, as well as to temperature conditions. Average production with the 660 and 880 ton machines is 30 shots per hour and with the smaller machines, from 70 to 100 shots per hour.

OPERATING EXPERIENCE AND ECONOMY OF OPERATION

In operation since 1950, the oldest magnesium melting and holding furnaces have proved their value in terms of operating record and economy and thus no basic changes in their design have been necessary. Some thought had been given to the possible use of larger units in the melting operation but a thorough analysis of the prevailing conditions revealed that the size originally selected represents an optimum. There is no economic advantage in going to larger units and at the same time it is obvious that a larger number of smaller units can be better adapted to actual production requirements. This is true when the objective is to achieve a minimum power consumption, particularly the power required for holding operations, and it is equally true of plant availability and minimum stock of spares.

In the last decade the total weight of all magnesium castings produced is 180 million pounds. The life expectancy of each crucible for a melting furnace averaged 1260 charges, each crucible having been remachined twice through its useful life. The minimum registered life expectancy of crucibles was 1000 charges, the maximum 1500 charges. The crucibles used with the holding furnaces are in operation from 500 to 600 three-shift operating days before replacement is indicated.

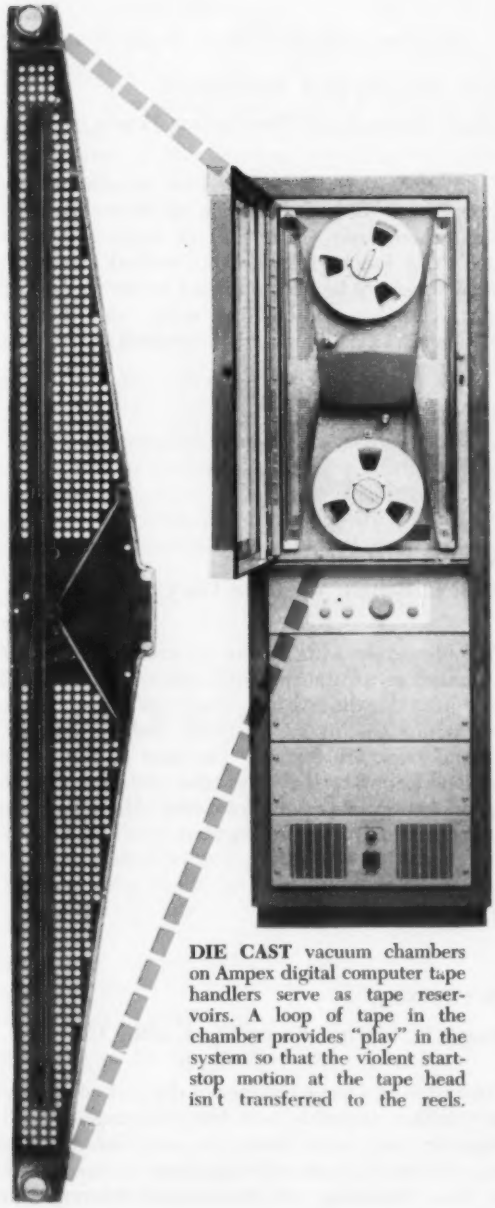
The power consumption for melting in continuous operation is 220 kWH/1000 lbs; the heat radiated by a holding furnace is 20 to 25 kWH with a partially closed lid.

Due to the simple layout of the melting installation only one operator is required to not only supervise but also charge and pour the production of four furnaces. Another operator is responsible for the transport of the metal from the melting to the holding furnaces.

A special process has been developed to press small magnesium chips into briquettes. With the monthly melting rate now averaging 6 million pounds, about 220,000 pounds of these chips are melted without any special precautions and are, therefore, regarded as "new" metal. Since the market price of magnesium chips amounts to only 30% of the ingot price, remelting

continued on page 108

ZINC DIE CASTING OF THE YEAR



DIE CAST vacuum chambers on Ampex digital computer tape handlers serve as tape reservoirs. A loop of tape in the chamber provides "play" in the system so that the violent start-stop motion at the tape head isn't transferred to the reels.

THE GRAND PRIZE winner in The New Jersey Zinc Company's annual "Zinc Die Casting of the Year" contest is this vacuum chamber for the Ampex FR-300 digital computer tape handler.

The $1000 award for grand prize was presented to Victor O. Anderson of A & A Die Casting Co., (see Industry News, Oct. PMM) as the person responsible for the design and production of the casting.

Previously, the vacuum chamber was machined from bar stock. They cut costs 95% by switching to the zinc die casting. The casting is 32" long, 3.25" wide, and 1.5" deep. Wall thicknesses vary from 0.025" to 0.175". Two 0.007" slots running nearly the whole length of the part are cast to within 0.020" of the surface before milling. There are 515 holes machined and countersunk in the casting. The edges of the chamber are chromium plated.

Other design requirements include flawless appearance, 1° maximum draft, and 0.005" radii on inside corners.

A 0.002" flatness is required around the entire face after chromium plating because a hinged glass plate placed over the face must seal off the edges to maintain a vacuum in each end of the chamber. Variation of flatness of the face and sides must be within 0.001" in any one inch.

The Ampex industrial design staff said the casting meets their rigid specifications in every respect.

ALL DIE CASTERS CAN ENTER

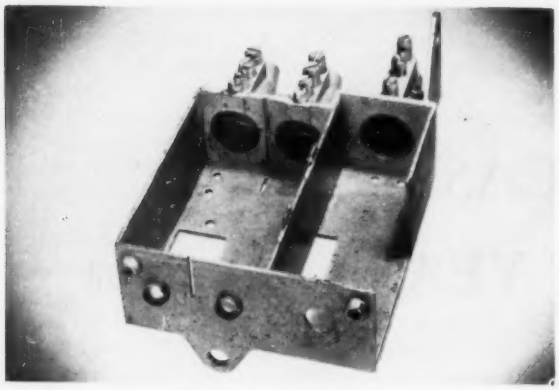
The contest was conducted by New Jersey Zinc as a means of recognizing the unsung talents of the die casting engineer. All die casting producers, captive and contract, were invited to enter the award competition. Castings were judged on:

- Originality and uniqueness of the application.
- Utilization of the special properties of material and process.
- Combining of component functions.
- Over-all production economy resulting from the design.
- Light-weight, thin-walled construction.

NINE "AWARDS OF MERIT"

Judges J. H. Schaum of Modern Castings Magazine, Norman Kewley of General Electric Co., and Ralph Dermott of Metal Progress Magazine made nine Awards of Merit to the runner-up castings shown on the following pages.

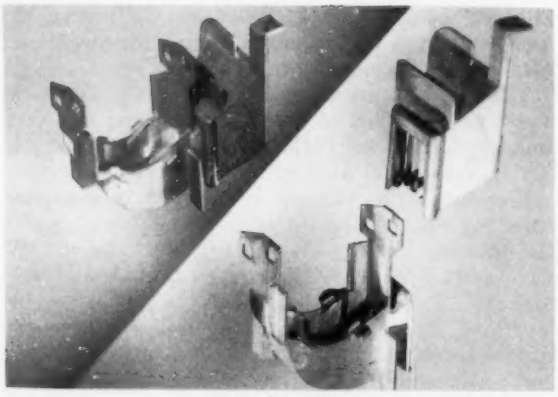
NINE CASTINGS WIN



TV TUNER HOUSING

by **Thomas F. Groden; Serv-All Die & Tool Co.**

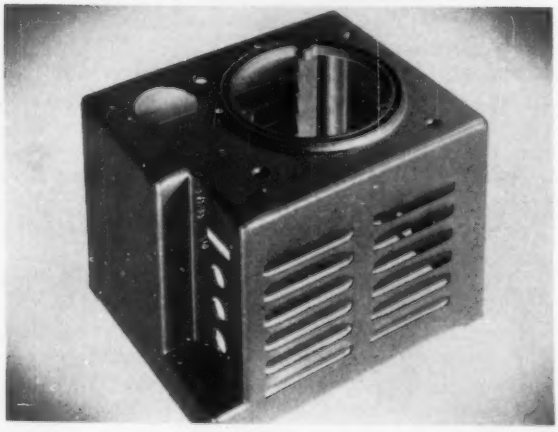
This Motorola television tuner housing was at first considered impossible to die cast. The three tapered cores at the rear of the casting must be withdrawn horizontally within the area of two vertical cores, yet the holes must be held to 0.002". Zinc was used because of the close tolerances required.



SLIDE PROJECTOR ASSEMBLY

by **H. C. Kisiel; Kisiel Die Casting Works**

These two castings are used as an assembly in a Graflex 35 mm slide projector to pre-heat the slides to prevent them from going out of focus during projection. The judges felt the thin walled construction typified what can be accomplished in the way of lightweight, complex construction using zinc die castings. Graflex said other metals couldn't fill the intricate shape.



BLOWER HOUSING

by **Paul E. Berndt; Westland Die Casting, Inc.**

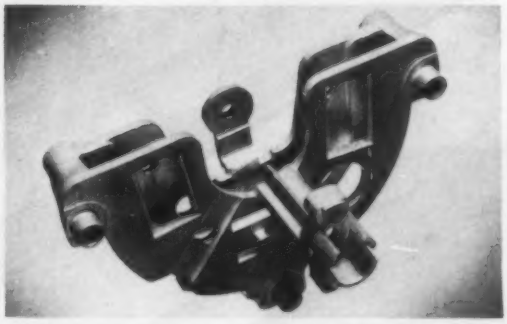
This blower housing for an air-conditioned helmet was chosen as an unusual utilization of the ductility of zinc alloy for die casting. The holes in the recessed corner of the casting are blanked, and the louvres in front and back are formed. The user of the casting, Jamieson Laboratories, says the design is highly functional and extremely low cost when compared to other methods of manufacture.

CAN OPENER

by **Roger M. Myrick; Union Die Casting Co.**

Utilization of a large number of die cast components in a complex assembly was the reason this electric can-opener and knife sharpener won an Award of Merit. On most of the castings there is no finishing other than trimming, yet dimensional tolerances are critical and most of the parts are plated or painted.

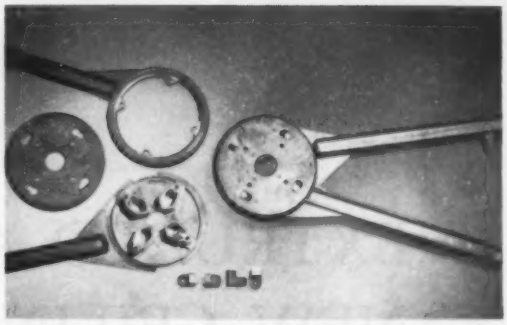
AWARDS OF MERIT



MOUNTING FRAME

by **Fred Wells; Peasley Products, Inc.**

Some dimensions must be within 0.0005″ on this mounting frame for a General Electric amp-volt meter assembly. GE said that this casting is equal to or better than previous designs, yet cost less.



FERRULE CLINCHER

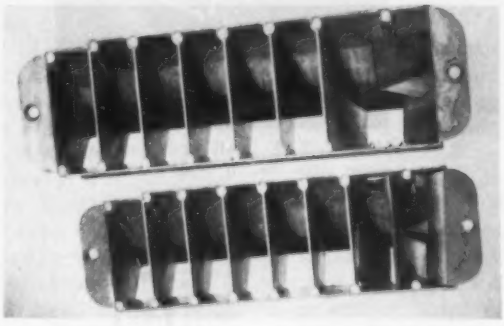
by **Trevor N. Davis; Twin City Die Casting Co.**

All eleven working parts in this ferrule clincher for polyethylene tubing are zinc die cast. The Cornelius Co., manufacturer of the clincher, says that zinc die castings cut costs without sacrificing strength, durability, or serviceability. None of the parts needs machining.

BOBBIN HOLDER

by **Harry C. Whitehead; Whitehead Die Casting Co.**

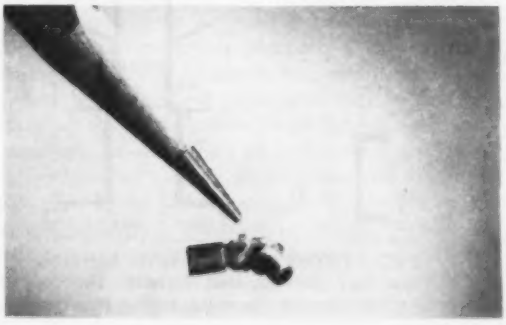
A 50% cut in casting cost was achieved by making all the major parts of this Whitehead bobbin holder from zinc instead of aluminum. Seven die castings are used in the assembly, which is a high volume item used on spinning frames in cotton mills.



HEATER OUTLET

by **Robert C. Cornell; Litemetal Dicast, Inc.**

Production problems for this 1961 Pontiac heater outlet were simplified by making it in three pieces. Zinc provided two big advantages. It permitted them to cast-in rivetable studs for assembly, and minimized finishing problems because of the smooth "as cast" surface.



TUBE COUPLING

by **George A. Meyer; Dollin Corp.**

The judges thought this tiny tube coupling was an outstanding example of a miniature zinc die casting. The part is used in Acousticon hearing aid eyeglasses made by Dictograph Products Inc. The cored holes are 0.062″ and wall thicknesses are from 0.015″ to 0.025″.

FIG. 1 THE EXTRUDED "BAR" (above) is used in 15 foot lengths joined by splice bars. The damper (below) regulates air flow.

EXTRUDED ALUMINUM VITAL IN NEW CEILING AIR-DISTRIBUTION

FIG. 2 THE BAR and damper in place with the air tube mounted on the bar.

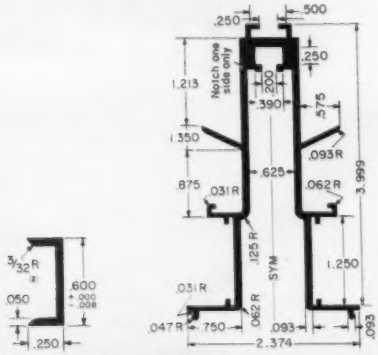


FIG. 3 CROSS SECTION of the bar extrusion and the extruded damper. The bar (right) supports the entire ceiling structure.

A NEW KIND of air-distribution system couldn't be designed until development engineers hit upon the idea of using extruded aluminum for some of the most critical parts of the installation. The new system delivers warm or cool air silently, uniformly and draft-free from the ceiling.

Precision Extrusions, Inc., Bensenville, Illinois, produces the vital extrusions, one of which is 15 feet long. Because of its light weight, strength and durability, this extrusion supports the air supply tube, even supports the suspended ceiling and distributes air uniformly along its entire length.

When Owens-Corning Fiberglas started working on the introduction of air through room ceilings for heating and cooling purposes, they found that existing methods weren't very good. High air velocities, for instance, created strong drafts and constant noise. Also, above-the-ceiling plenum systems usually demanded oversized conditioning units to overcome loss of warm or cool air from leaks through surrounding surfaces, and required additional insulation on the plenum surfaces.

Owens-Corning engineers knew they would have to design a system which would combine the positive delivery of air through self-insulated tubes with full *wall-to-wall* diffusion. Such a system might never have become a reality without the adaptability and low cost of aluminum extrusions.

Once the obvious choice of extruded aluminum had been made, the assignment of producing the extrusions was given to Precision Extrusions, Inc. This company brought out a light, semi-hollow, 15 ft. long aluminum extrusion called the "bar." Shown in Fig. 1 and Fig. 3, this diffuser bar has a special flange to support

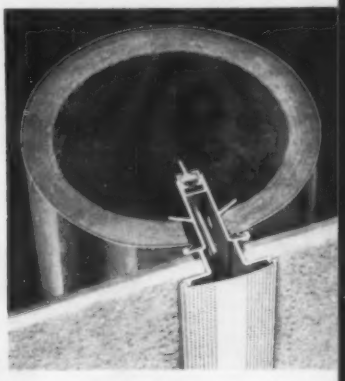


FIG. 4 A COMPLETED installation with a cross section of the complete assembly. Draft free air is assured by this construction.

REVOLUTIONARY SYSTEM

the ceiling. It is hung directly from the structure above the ceiling by wire or pencil rod hangers, 6 ft. on center or as required by local conditions. Another part supplied by the extruder is the "damper," which is shown in Fig. 1. It is installed inside the bar to control the air flow.

For the extrusions, the company uses a mild alloy (6063), primarily an aluminum silicon-magnesium alloy which can be heat-treated. To meet strength and durability requirements, heat-treating is done to T5 condition.

Extruding the 15 ft. bar presented Precision with formidable difficulties since it is semi-hollow along its entire length, as illustrated in Fig. 3. Because of this channel, the die's tongue is subject to extreme flexing under pressure—a flexing which, after a certain period, results in fatigue. At this point, the tongue takes a permanent set, and the die has to be replaced. While die life for the bar extrusion is relatively short, dies for the other extrusions are simpler and have considerably longer life.

From the efforts, then, of many technical people working at opposite ends of the problem, came the Fiberglas Acousti-Flo System. It is best described as a revolutionary new low velocity method of bringing conditioned air uniformly and quietly into a room. The aluminum bar diffuser is also used to support the ceiling, which is immediately below it. A Fiberglas tube, as shown in the cross section drawing—Fig. 2, conveys the conditioned air down the length of the bar, absorbs system noise and insulates.

By avoiding use of heavy air streams, the new method eliminates drafts and assures that conditioned air from the bar mixes gently and rapidly with room air. Air delivery is uniform, as controlled by the extruded aluminum continuous dampers. From ceiling to floor, temperature variation is at a minimum and "dead spots" are practically non-existent.

The use of extruded aluminum also helps make this air-distribution system an inexpensive installation—low in initial cost as well as in operating cost. Installation is fast and simple as only four easy steps are required to install a ceiling-type air distribution system and a ceiling support as well. As shown in Fig. 2, wire or pencil rod hangers are hung from the structure immediately above the ceiling. The 15 ft. long extruded aluminum bar is then installed by inserting hanger slides into tracks on the bar and attaching to the hangers. Bars are connected end-to-end by a bar splice. A 3 ft. length of slit Fiberglas tube snaps over the flanges on the bar.

The tube is now covered with a tempered aluminum jacket, which has a flanged lip that snaps into a recessed slot in the bar. End joints of the jacket are lapped. Next, the acoustical tile or ceiling board is installed at the bar, and the acoustical suspension system is concealed or exposed between bars. After installation of the ceiling is completed, the extruded aluminum damper is adjusted for required air delivery, and the anodized aluminum cap is snapped into place on the bottom flanges of the bar.

Maintenance is described as being at a minimum. The cap which fits on the diffuser bar can be easily snapped off and on for cleaning or for access to the previously mentioned continuous damper. This system requires no more space above the suspended ceiling than most conventional systems and needs no plenum dividers or special insulation for outside walls.

LARGE CASTINGS produced by the ceramic shell method. These are not the largest which can be made, but are good, representative samples of average production.

Now . . .

BIG INVESTMENT CASTINGS / PART I

. . . have broadened the designers' horizon

By HENRY LEFER, *Eastern Editor*

IT'S A GROSS MISCONCEPTION—what?—the idea that all investment castings have to be small and intricate. That is, unless you design for the Mercast process. But this process is somewhat limited by costs.

Now, there's a new development in the investment casting industry. It's called ceramic shell and has made possible castings in stainless steel up to 3½ feet long; they weigh over 45 pounds. The Arwood Corp. has made castings this big and with an ultimate tensile strength of over 200,000 psi. Such a casting is also extremely intricate, is dimensionally accurate, held to close tolerances, has a good surface finish, and was cast in a ceramic shell mold.

This 45 pound casting is not the limit. Arwood has gone as high as 85 pounds and even that isn't the apparent limit. William Matthes, Arwood's president, says that on the basis of geometry, 200 pound investment castings should be no problem. Needed is adequate melting capacity and he hopes to have that soon.

The process is only a variant of more conventional investment casting. A wax or plastic disposable pattern is made as usual. Then, instead of investing it in a flask the pattern is coated with a ceramic mold material by dipping it in a fast drying slurry. After the shell has been built up to the desired thickness it's dried and fired. This melts out the pattern and causes chemical and crystallographic changes in the shell so that it is strong enough to accept a large pour of metal.

On these large castings dimensional tolerances of 0.005 in./in. are held. Because shell molds permit close control of cooling rates, a casting with the most desirable structure is produced. Further, the porosity of the shell permits rapid gas escape so that entrapped gases and surface irregularities due to gas are absent.

With three methods of casting available, Arwood can now select the best, most economical method for each casting, regardless of size or geometry.

Here are a few big investment

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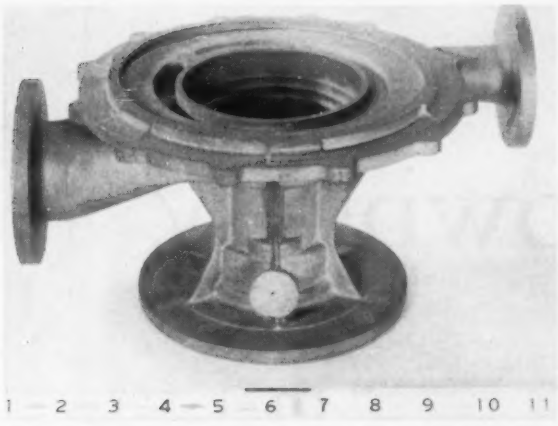
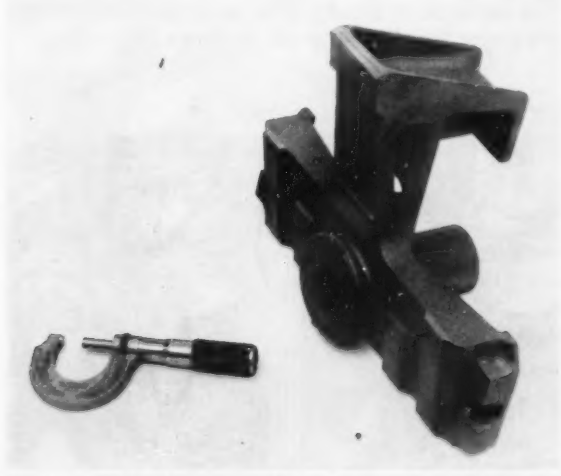
castings from Arwood.

Part II of this article will appear next month



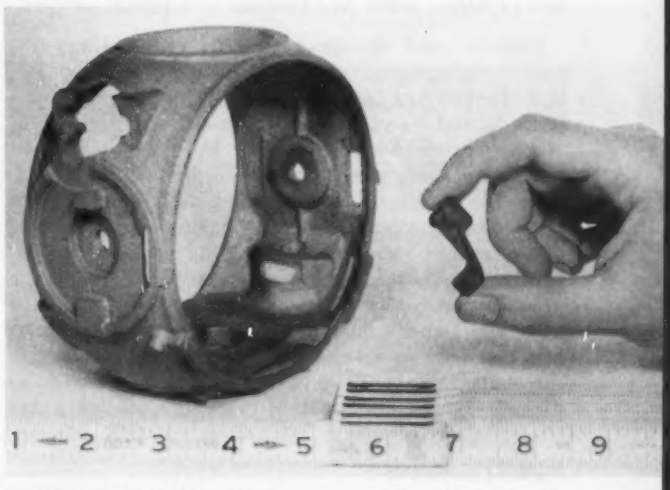
INTRICATE CORING, thin walls, and type 316 stainless steel are some of the features of this rocket engine pump housing.

A 20 TON SHOCK has to be withstood by this telescopic sight every time the 105 mm tank gun is fired.



AIRLINE PASSENGERS trust their lives to this 347 stainless steel casting. It's part of the thrust reverser for an aircraft.

130,000 psi AFTER HEAT TREATMENT is the requirement for this control bracket cast in 410 stainless steel. It's an aircraft casting.



WHAT PEOPLE THINK of as a conventional investment casting is dwarfed by this ceramic shell, investment casting in 17-4 PH.

CONCENTRICITY within 0.039 t.i.r. is held on this large support for a turbine nozzle. Cast in N155 alloy, it's X-ray, penetrant, and zyglo inspected. The small casting is not ceramic shell cast.

SINTERINGS

COMPOSITE POWDERS / PART II

By J. A. LUND, T. KRANTZ, and V. N. MACKIW

SINTERING AND ALLOYING STUDIES

Density and electrical resistivity measurements, and metallographic examination, were used to follow the progress of alloying and sintering in compacts heated for various times. Actually, sintering and alloying proceed simultaneously by diffusion in two-component compacts. They are not independent processes. To eliminate the unpredictable effect of voids on electrical properties, all heated compacts were fully densified and annealed prior to the measurement of resistivity. Therefore, the resistivity determinations probably provide a useful indication of the extent of alloying. Density measurements show the sintering progress only in a limited sense, because changes in the shape, size, and number of voids in a two-component compact on heating are the result of many effects, some of which are associated with alloying.

Nickel-Copper

Green compacts of composite (C1) and mixture (M1) powders, and finer composite (C2) and mixture (M2) powders were heated in cracked ammonia from 5 minutes to 24 hours. Two temperatures, 1900° and 2200°F, were studied for the C1 and M1 compacts. The higher of these temperatures is above the melting point of copper. For compacts of the C2 and M2 powders, only the 1900°F temperature was used.

For a description of the compacts, see PMM, Oct., 1960; pg. 56.

The results of density measurements after various times of heating at 1900° and 2200°F are plotted in figures 11 and 12. Both the C2 and M2 compacts densified continuously and rapidly at 1900°F, approaching 95% of theoretical density after 1 to 2 hours. For the courser powder compacts, however, there was a marked difference in behavior. At both 1900° and 2200°F, the density of M1 compacts decreased almost continuously with time of heating, dropping to 62% of theoretical after 4 hours at 2200°F and to 83% of theoretical after 8 hours at 1900°F.

Figure 9 compares the microstructures of M1 and C1 compacts after 30 minutes at 2200°F. Extremely coarse voids can be seen in the M1, but only fine pores are visible in the C1. Grain size in the M1 compact is also substantially greater.

Prior to electrical resistivity measurements, all compacts were densified by a series of four cold rolling treatments (30% reduction), each followed by a 10-minute annealing operation at 1700°F. The results of resistivity measurements on compacts heated at 1900°F and 2200°F prior to rolling are plotted in figures 13 and 14. Values of resistivity for zero time on these graphs were obtained from green compacts which were subjected only to the rolling procedure just described. They were not heated above 1700°F. The cold rolling alone was enough to make the M2 and C2 compacts almost fully homogeneous.

A much more rapid rate of homogenization in the composite powder compacts is shown by a compari-

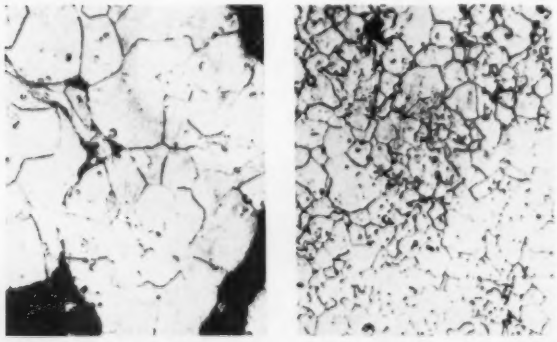


FIG. 9 NICKEL-COPPER compacts heated 30 min. @ 2200°F 205X. Mixture M1 left, composite C1 right.

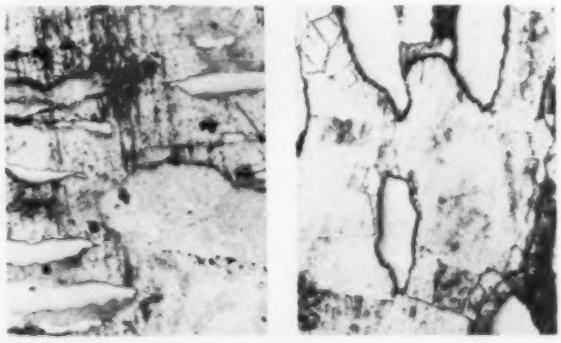
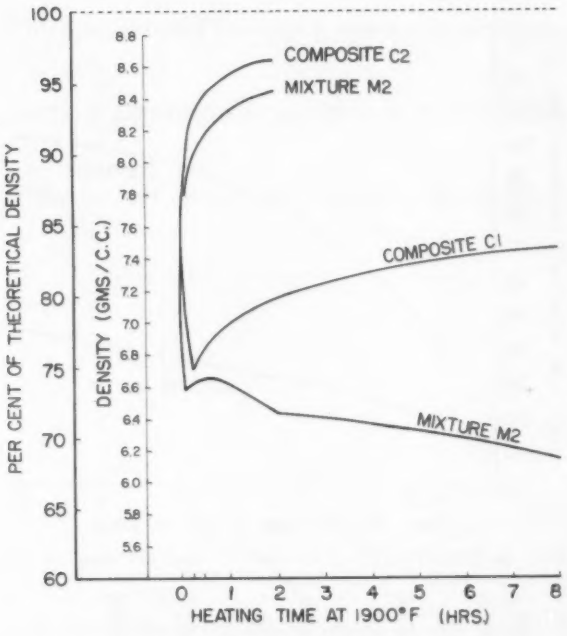


FIG. 10 PREDENSIFIED COMPACTS sintered for 3 hours @ 2200°F 300X. Composite C4 left, mixture M4 right.



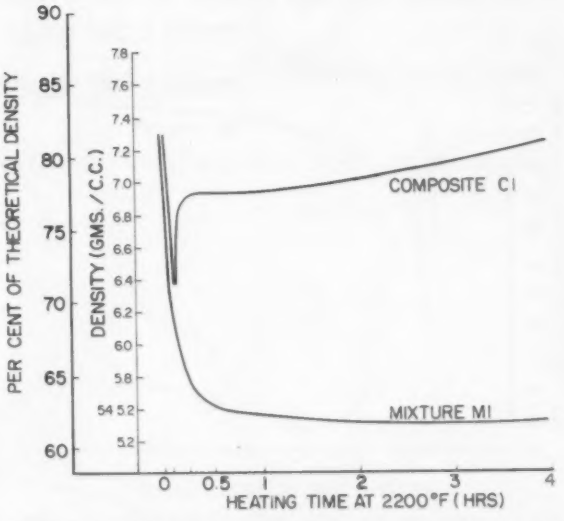


FIG. 11 DENSITY of M1, M2, C1, and C2 compacts as a function of heating time at 1900°F (left). Density of M1 and C1 compacts as a function of heating time at 2200°F (above).

son of resistivity data for C1 and M1 compacts. Part of the difference between the alloying behavior of the two compacts is explained by the much greater expansion of M1 compacts indicated in figures 11 and 12, because the development of large voids tends to increase the length of diffusion paths. However, it is also significant that the cold rolling alone caused much more alloying in C1 than in M1 compacts.

Nickel-Molybdenum

Green compacts were pressed from Composite C3 and Mixture M3 to nearly equal density, 7.25 g/cc. Sintering and homogenization were carried out by heating at 2200°F in cracked ammonia for periods of from 15 minutes to 2 hours. For the nickel-molybdenum compacts, the alloying only was followed quantitatively by using electrical resistivity measurements. Density rose rapidly for all compacts, owing to the fine particle size of the powders.

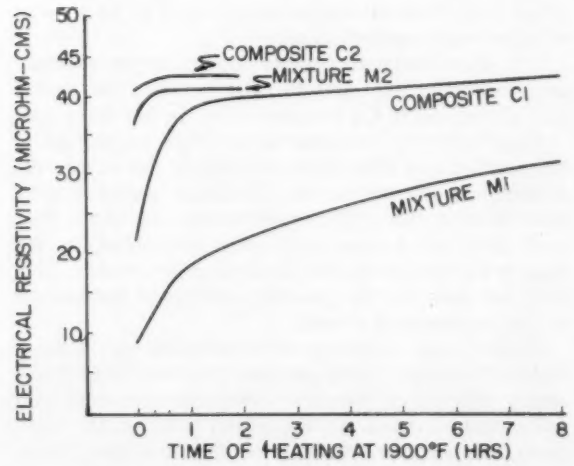
The densification procedure before measuring resistivity consisted of four cold-rolling reductions, each followed by an annealing treatment. The first three anneals were at 1900°F for 10 minutes. The final anneal was at 2200°F for 5 minutes.

Results of resistivity measurements on rolled specimens are plotted in figure 13. Alloying seems to have been much more rapid in the composite powder compacts, particularly in the early stages of sintering. As with nickel-copper compacts, the cold rolling procedure alone caused an appreciable degree of alloying.

Nickel-Chromium

Compacts were pressed from composite powder C4 and Mixture M4 at 40 tsi. These were sintered for 1 hour at 2200°F in dry hydrogen, then pre-densified by 3 cold-rolling reductions with 2 intermediate annealing treatments, each 15 minutes at 2200°F in hydrogen.

Metallographic examination at this stage showed that the rolled compacts were still quite heterogene-



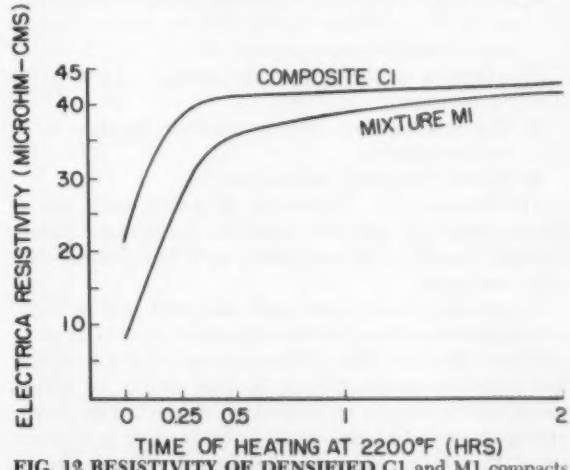


FIG. 12 RESISTIVITY OF DENSIFIED C1 and M1 compacts vs. heating time. (Left) at 1900°F, (above) 2200°F.

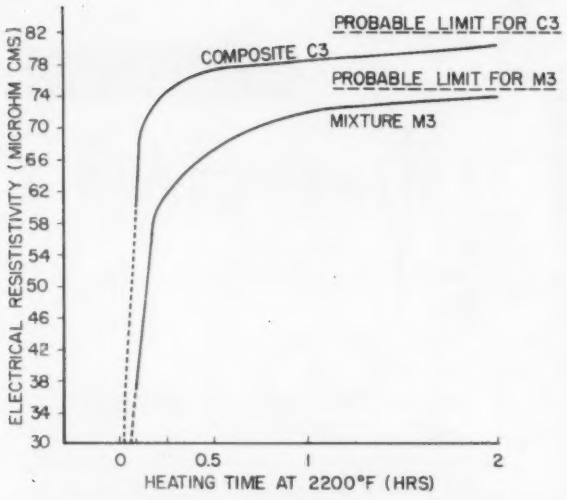


FIG. 13 RESISTIVITY of densified C3 and M3 compacts as a function of heating time at 2200°F.

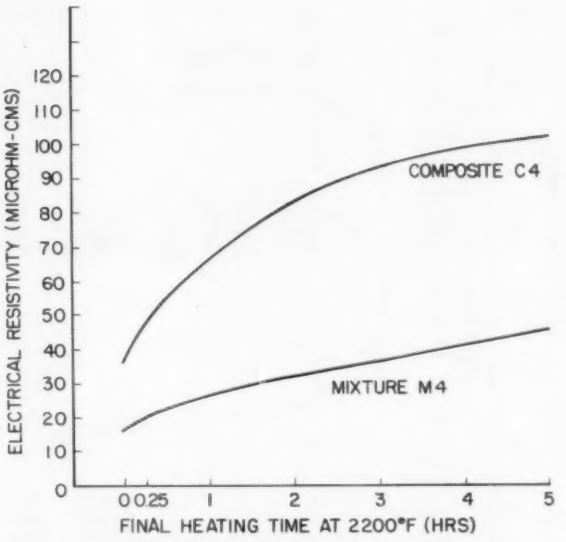


FIG. 14 RESISTIVITY of densified C4 and M4 compacts as a function of finat heating time at 2200°F.

ous. Further heat-treatment was carried out at 2200°F in hydrogen for from 15 minutes to 5 hours. Electrical resistivity was used to follow the progress of alloying during this final treatment. The results are plotted in figure 14.

After 3 hours at 2200°F, the rolled C4 compacts had alloyed an appreciable amount (Figure 10). Some porosity had developed as a result of the Kirkendall Effect. A small part of the observed electrical resistivity of these compacts probably was due to the presence of pores.

Rolled M4 compacts were very slow to alloy at 2200°F. Metallographic observation of these specimens after 3 hours at 2200°F showed a considerable amount of unalloyed chromium, as shown in fig. 10.

DISCUSSION

An extremely intimate mixture of two components can be obtained when:

- One is suspended in solution in a finely-divided form,
- The other is precipitated from solution uniformly on to the surfaces of the first to produce composite two-component particles.

To obtain a similarly intimate mixture of two powdered components requires:

- The selection of powders whose particle sizes are compatible
- Special blending techniques.

Furthermore, the dispersion of components inherent in composite powders does not deteriorate during storage, handling, or processing, as is the general case with mixtures.

Composite powder compacts alloyed faster at higher temperatures than mixture compacts of similar composition. Much of the difference in behavior of the two types of compacts may be due simply to differences in the degree of dispersion of the components. However, some of the results obtained in our study show that there are other important advantages of composite powders.

In the case of the nickel-21% chromium compacts, for example, there was somewhat more agglomeration of chromium particles in mixed powder (M4) compacts than in composite (C4) compacts. The large difference in alloying behavior of M4 and C4 compacts shown in figures 10 to 14, however, cannot be explained satisfactorily in terms of the relative distributions of the components alone. Even some of the smaller chromium particles in the mixed powder compacts did not appear to have started going into solution after 3 hours at 2200°F (figure 10). Two possible explanations are offered for this observation:

(a) Oxide or nitride deposits formed on the chromium particles in M4 compacts on heating at or below 2200°F and acted as a barrier to diffusion. Since heating was performed in dry hydrogen, the main sources of oxygen and nitrogen would be air trapped in the pores during compaction and oxide originally present on the surface of the fine nickel powder used in M4 compacts. In the case of C4 compacts, the nickel coating covering much of the surfaces of the chromium core particles probably partly prevented reaction with oxygen and nitrogen in the early stages of heating, when such elements might be expected to be present in significant concentrations.

(b) More intimate contact over a larger interface area might be expected to exist between the nickel and chromium in C4 compacts than in M4 compacts.

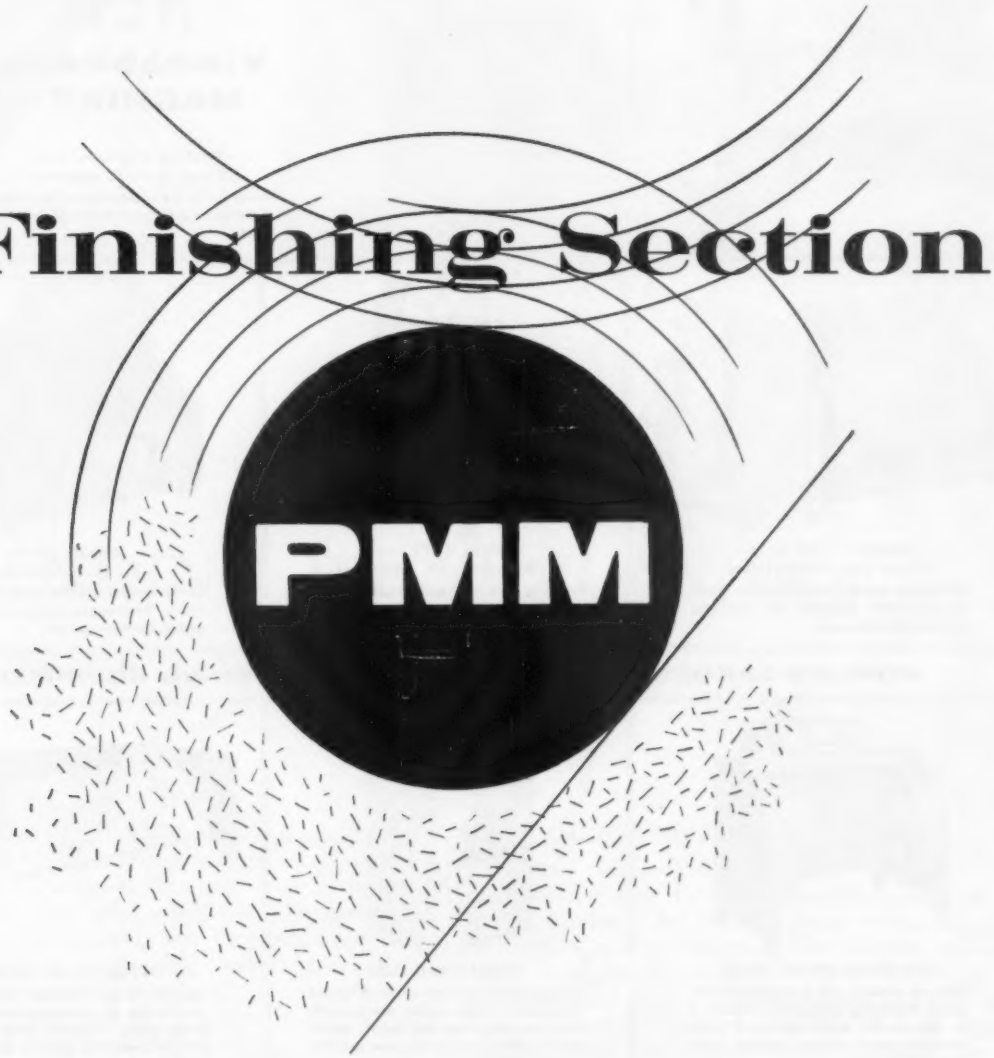
Metallographic examination at high magnification has verified that films of oxide, nitride (or other substance) are present on the chromium particles after short heating times. This examination also shows that such films are heavier and more continuous in M4 than in C4 compacts after equivalent treatments. This does not rule out the possible validity of the second of the explanations above.

Density and resistivity measurements on sintered nickel-30% copper compacts also point out some interesting differences between composite powders and equivalent mixtures. In the mixed powder M1 compacts, copper is continuous in the structure. How-

continued on page 88

The specialized finishing methods, equipment and materials used to machine, assemble, surface condition or surface coat precision metal molded parts are presented here. This includes all secondary operations which convert a raw casting to a finished product.

Finishing Section



BENDING EXTRUSIONS .....Page 61

PLATING WITH HIGH-PURITY ANODES .....Page 66

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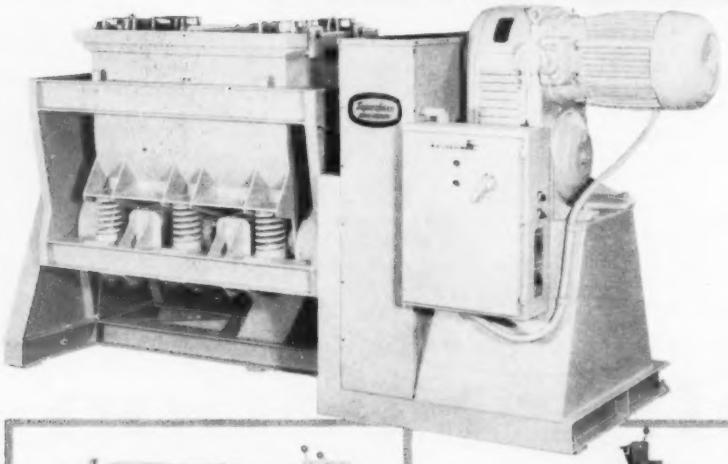

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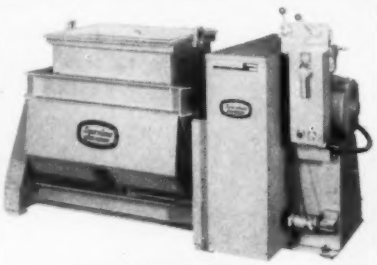

MODELS VT-77 — 75
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Efficiently deburrs and finishes parts in quantities suitable for medium size production runs.

MODELS VT-72 — 71
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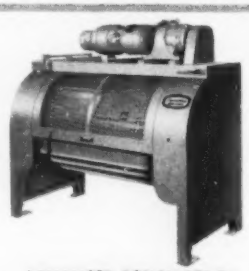

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BENDING EXTRUSIONS/ Part II

THE CASE HISTORY OF A CHAIR

ATTRACTIVE AND FUNCTIONAL chair legs are made by the General Fireproofing Co., fabricators of office and institutional furniture, from extrusions which are bent, then anodized. Bending the extrusion is a simple and economical way to get a sturdy, attractive support for the chair top. Anodizing enhances and protects the natural beauty of the metal. It prevents corrosion and hardens the surface so that minor scratches don't mar the appearance.

These are some of the other advantages:

- Aluminum is light, easy to form and cheaper than other suitable materials.
- Extrusions have a uniform amount of springback when formed.
- Tooling costs are low.
- There is no penalty for small orders.
- There is no scrap when the pieces are ordered to length.

FABRICATION STEPS

General Fireproofing buys the 6063 aluminum extrusions (figure 1) in the annealed condition because they can be formed easier when the yield strength is low compared to the ultimate strength. They bend the leg in three stages. To prevent the extrusion wall from collapsing during bending, they feed a shaped, link-type mandrel into the leg. A shaped clamp and shaped follow bar bend the leg around a plain hub, figure 2. After bending, they heat treat it to the T6 condition, then, drill nine holes.

Small bends, such as those needed for the back of the fixed-leg chair, are formed in a press with a simple, leaf-type mandrel, figure 3.

Before anodizing, they surface finish the part with #80 grit sandpaper as follows:

- Belt finish the bottom and sides.
- Radius wheel finish the corners.

- Shape wheel finish the corners.

If the leg is to be color anodized, the whole surface must be rubbed with steel wool. This produces a finer, smoother, brighter color anodized finish.

ANODIZING PROCEDURE

This is how they apply a bronze anodized finish. Voltage, temperature, and length of cycle will vary with different colors.

1. Strip the anodize from the previous cycle off the rack with an acid stripper.
2. Rack the parts.
3. Soap the parts by dipping and brushing on Clepo 85 D. Remove all loose dirt. Do not let the soap dry.
4. Rinse with clear cold water.
5. Clear anodize at 70°F for 30 minutes at 15 volts.
6. Rinse twice in cold water.
7. Place extrusions in the dying tank at 138°F for 2-5 minutes.
8. Rinse with cold water.
9. Dip in nickel acetate sealer at 190°F for 5 minutes.
10. Rinse.
11. Remove scum from sealer with steel wool.
12. Unrack and dry.

Figure 4 shows chairs passing through the anodizing tank.

A two tone anodizing effect can be had by using paint to mask the part. First, the extrusion is color anodized, then painted over the areas where that color is desired. The paint is baked, and the anodizing stripped. The anodizing under the paint is not removed. Then the extrusion is reanodized a second color. The paint is removed, exposing the first color anodizing, creating a two tone anodized finish.

MOST JOINTS WELDED

After anodizing, the leg is ready for assembly. For the lounge chair, the legs are bolted to the chair frame. This is one of the few mechanical joints which General Fireproofing uses. Most of them are heliarc welded because it produces a fine, smooth finish. All welds are spindle ground until they blend with the surrounding metal.

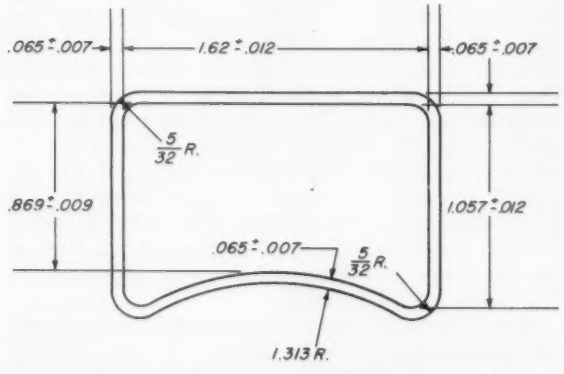
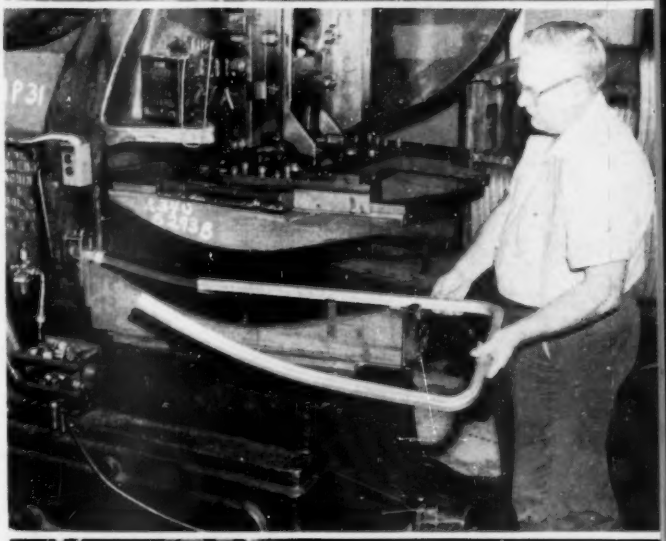
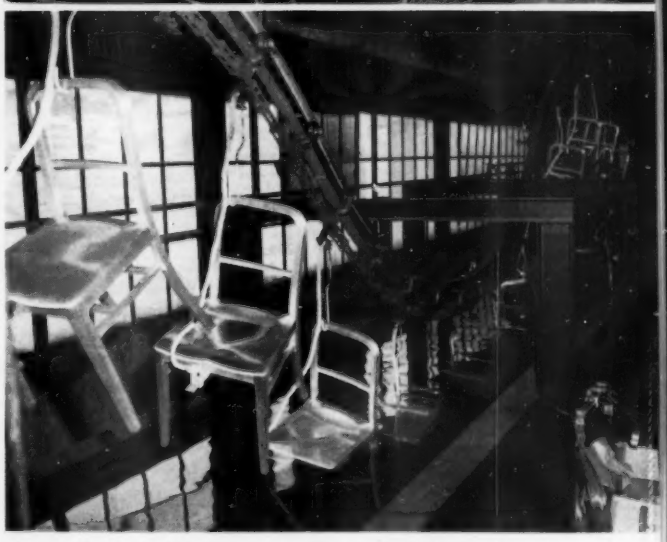


FIG. 1. THIS THIN-WALLED EXTRUSION is bent to form sturdy legs for General Fireproofing's lounge chair.





BENDING EXTRUSIONS at General Fireproofing. Figure 2 (top) shows the extrusions being bent on a hydraulic bending machine. A link-type mandrel supports the interior of the extrusion. Figure 3 (middle) shows a press and leaf-type mandrel used to form slight bends. Figure 4 (bottom) shows fixed-leg sturdy legs for General Fireproofing's lounge chairs.

SUPERIOR CASTINGS, EXTRUSIONS, TRACED TO USE OF ACHESON COLLOIDAL GRAPHITE

The excellent lubricating properties of these materials have been proven under the severe conditions attendant to aluminum permanent molding and extruding. In the specific examples described below, smoother surface finishes, longer die life, and more uniform metal flow are chiefly attributed to the application of a 'dag' brand dispersion.

Fewer rejects, consistently higher quality castings are obtained at Paragon Aluminum Corporation by spraying 'Prodag' on their permanent molds as a pre-pour wash.

Better surface finish with Prodag® permanent mold coating is just one of the reasons why Paragon Aluminum Corporation, a Division of Detroit Harvester Company located at Monroe, Michigan, switched to this Acheson product. After four years of experimentation with other mold washes, Paragon chose 'Prodag' — Acheson semi-colloidal graphite in water — and has used it constantly the past seven years. The reasons for its choice are these: uniform consistency, excellent heat-transfer quality, and its hard, smooth, tenacious film which resists flaking and provides easier parting characteristics.

With about 95 per cent of its annual output of more than two million pounds of castings going to the automotive industry, Paragon must insist upon quality. 'Prodag' helps to maintain this standard. Parts for convertible automobile tops are precision-molded from both 355 and 319 aluminum alloy. Molds are pre-heated before each day's run to 600° F. and the casting cycle maintains this temperature. The 'Prodag' dilution ratio is 1 to 4 parts water and is applied to the molds with a commercial spray gun. Aside from occasional touchup at points of greatest wear, this coating lasts through the entire run. Because of the physical contours involved in these comparatively small, light castings, they require rapid cooling in certain areas to insure uniform strength. The 'Prodag' coating — with its proven fast heat transfer ability — allows the castings to cool without breaks or pinholes. And by parting more easily, the high-finish castings which result have given Paragon Aluminum products wide acceptance in this demanding industry. If you have a metal casting problem, write direct for additional information contained in our Bulletin No. 425. Address Dept. PM-10

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FASTER APPLICATION, LESS MATERIAL USED IN THIS EXTRUSION APPLICATION

Aluminum Extrusions, Incorporated, of Charlotte, Michigan, has realized a 30% savings in their material handling costs by the use of Aquadag® — Acheson colloidal graphite in water. They formerly had used an oil-graphite mixture which required a dilution ratio of 16 lbs. of graphite to a 55 gallon drum of oil. It was too slowly applied by swab and too coarse to effectively apply by spray.

With 'Aquadag', Aluminum Extrusions has a lubricant that is finer in particle size, permits wider coverage, and provides greater "sprayability". These minute particles pass freely through the spray nozzle, eliminating the costly downtime formerly involved in cleaning clogged equipment. The tough, dry film 'Aquadag' forms upon the evaporation of its water carrier, doesn't smoke or react when applied to hot dies and metals. This improves working conditions as well as extends die life. Important also to both die surfaces as well as the finished extrusion, is the fact that this durable, low-friction film allows easier, more uniform metal flow.

Acheson 'Aquadag', applied on die surfaces provides faster, more uniform application for Aluminum Extrusions, Incorporated.

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NEW PRODUCTS
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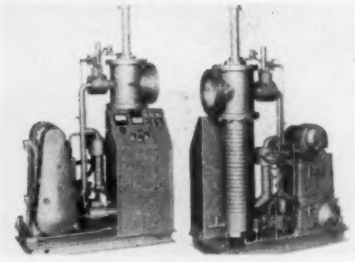

F. J. STOKES CORP.—This front and back view shows one of a series of packaged vacuum pumping systems intended for high-volume evacuation. These systems should be of interest to original equipment designers since they arrive completely assembled.

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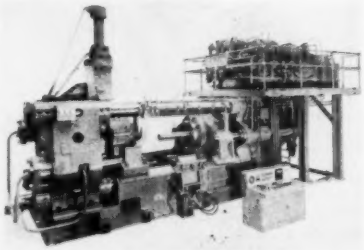
EXTRUSION PRESS



SUTTON ENGINEERING CO.—This 2200-ton extrusion press runs at high production speeds and has fully automatic operation. A remote control panel at the front of the press permits starting or stopping the cycle and regulating extrusion speed from the runout table or the control pulpit. Dead cycle time is low for maximum production.

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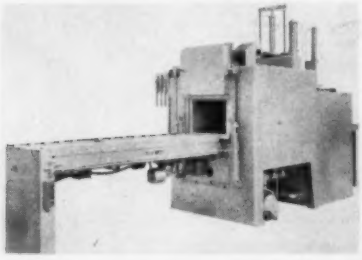

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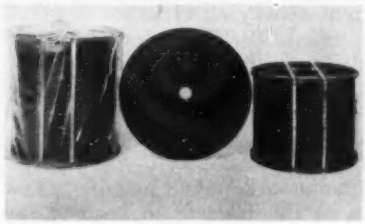

CHICAGO WHEEL & MFG. CO.—Aluminous oxide resin bonded abrasive discs for metal cutting are available in five standard grains. One 100-unit package of #60 grain "RD" discs sells for under $30.

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continued on page 90

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- get more efficient use of the anode.
- spend less down time replacing anodes and removing sludge from the plating tank.
- find that current density is not as critical. Densities of 60 asf do not cause roughness.

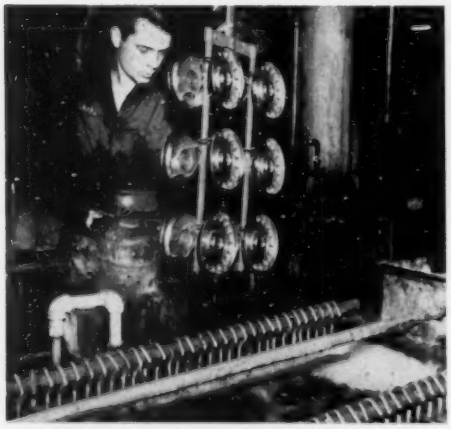
WHY DO THESE ANODES PRODUCE BETTER PLATING?

No one seems to know for sure, according to Mr. Gerald Van Tilburg, metallurgist and technical service engineer at American Metal Climax, Inc., producers of OFHC® brand anodes. The important thing to remember is that in an ideal plating bath, copper should dissolve ion-by-ion from the anode, travel to the cathode, and plate out of solution ion-by-ion. When larger chunks of the anode break off, plating tends to get rough. Van Tilburg has outlined several theories explaining how anode impurities might disrupt an ion-by-ion transfer:

COPPER OXIDE. Most copper used as anodes contains 0.03-0.05% oxygen which is present at the grain boundaries. The plating solution attacks the $Cu\text{-}Cu_2O$ complex faster than it attacks the grain of copper. Therefore, the grain is undermined and small copper grains are released at the anode. These grains either float to the cathode and plate, causing roughness, or sink to the bottom of the tank as wasted copper.

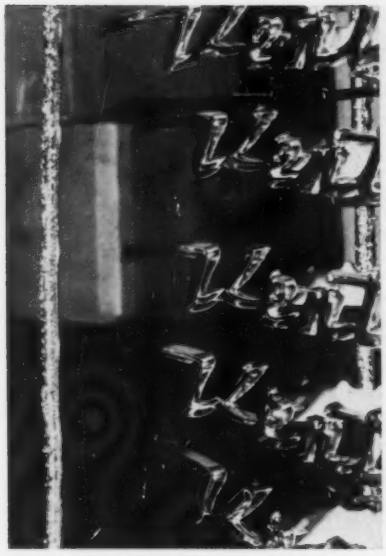
CURRENT DENSITY VARIATION. When oxide is present, grain boundaries form a point of high current density and are attacked at a faster rate. This weakens the grain attachment, and permits it to be pulled from the anode. The fact that rolled oxide bearing copper performs better than "as cast" supports this theory. Rolling the copper produces a finer grain structure, creating so many points available to attack that the current density effect is not as great. On the other hand, rolled OFHC anodes usually do not perform as well as the "as produced" material, possibly because of scale or oxygen introduced in the rolling process.

OXIDE TRANSFER. The oxide is transported as minute particles by solution flow and agitation. This oxide "dust" settles on the cathode to become the nucleus for roughness.

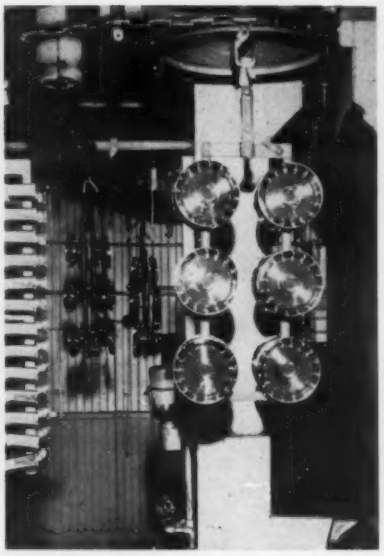


AUTOMOBILE back-up light blanks being removed from the semi-bright nickel dip tank.

A COPPER STRIKE is used prior to copper plating. This prevents immersion plating in the copper bath.



THE ROBBER strip on the left prevents high current densities at the end of the script lettering.



AFTER final rinse, a conveyor carries the plating racks through a 120°F drying oven to remove all moisture.

THE RACKS move from the drying oven to the unracking station, where the plated parts are packed for shipping.

ANODE IMPURITIES. Impurities in copper, though small, can contribute to roughness. Any elements insoluble in cyanide will add to the copper sludge. When stirred by solution flow they may settle on the work to cause roughness.

Van Tilburg pointed out that it is hard to determine exactly what effect copper impurities produce since many factors affect anode behavior. Some of these are:

- the composition of the plating solution.
- the amount and type of addition agents.
- the level of caustic and free cyanide maintained.
- operating temperature of the solution.
- amount and type of agitation.
- anode current density.

Too low an anode current density causes an excessive amount of powdery sludge which can float to the cathode. Too high a current density causes the anode to form a passivating film which, when broken, generally flakes off in large chunks. The only effect that grain composition and structure have in these situations is that they set the range between the two conditions.

Also, diaphragming changes the solution composition in the anolyte compartment. This tends to increase anode polarization and lower the point of anode passivation.

To add to the complications, some factors which aid anode corrosion adversely affect the cathode.

LESS DOWN TIME

With conventional anodes, corrosion is usually uneven, with severe necking at the solution level. In such cases the anodes must be replaced before they break and drop to the bottom of the tank. With the better structure of OFHC anodes, corrosion is uniform. Larger chunks aren't being pulled off the anode to weaken it or form sludge. The plater uses more of the copper he paid for.

OFHC anodes also eliminate the need for diaphragming and filtering equipment used to keep impurities from the cathode. This alone might justify the use of the more expensive anodes when a new installation is being planned.

CASTING SURFACE IS STILL IMPORTANT

Elmer Blackney, chief chemist at Detroit Die Casting, says, "The surface finish of the casting is still one of the most important elements in the plating process." These are the factors Detroit Die Casting watches to insure good surface finishes on their castings:

- Die Temperature: It must be correct when the shot is made, otherwise a too cold or too hot shot will produce a pattern on the casting surface. This pattern will show when plated.
- Melt Temperature: For the same reason as die temperature.
- Die Gating: Correct gating holds down casting porosity.
- Alloy Composition: Necessary to get good adhesion, avoid crumbly casting surfaces.

Since the skin of a die casting is least porous, they try to hold buffing to a minimum so that they can plate over the dense skin. On some parts they plate right out of the die with just gate and flash removal. Script lettering or other parts without large flat surfaces can be plated this way. Blackney says that if a casting is clean and of the right alloy composition, you can tell by looking at it whether or not it will plate correctly. "Of course, it takes some mighty close examination to find small pores," Blackney added.

OFHC is a registered trademark of American Metal Climax, Inc. for oxygen-free, high-conductivity copper.

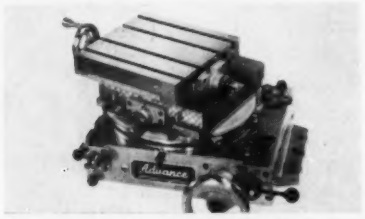
FIRST NATIONAL DIE CASTING EXPOSITION

. . . here are some of the products exhibited

THE FIRST National Die Casting Exposition & Congress, sponsored by the Society of Die Casting Engineers, is being held in the Detroit Artillery Armory from November 8 to 11. Here are some of the Exposition exhibitors and brief descriptions of the products featured at their booths. The booth numbers are listed after the company name.

There is a list of the other exhibitors on page 86. For readers who cannot attend the show but would like information on these products, circle the appropriate number on the Reader Service Card facing pages 82 and 83 of this issue.

ADVANCE PRODUCTS CORP. 140



. . . is displaying this cross slide rotary table which eliminates manual set-ups in rotary milling. They'll also display die casting shot sleeves, bushings, and plunger tips.

Circle No. 307 on Reader Service Card

ALDRIDGE INDUSTRIAL OILS, INC. 145

. . . is showing die castings made using Aldridge Lo-Smoke Die Casting Lubricants.

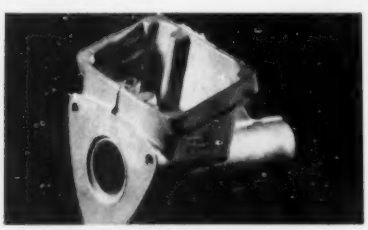
Circle No. 308 on Reader Service Card

APEX SMELTING CO. 104

. . . is exhibiting their line of aluminum, magnesium, and zinc alloy ingot, and continuous cast aluminum rod.

Circle No. 309 on Reader Service Card

BENDIX CORP. 212



. . . will show some of their die castings in the Lester-Phoenix display. The casting above must withstand 2300 psi hydraulic pressure.

Circle No. 310 on Reader Service Card

CELANESE CORP. OF AMERICA 142

. . . has an exhibit which stresses their production capacity, quality, engineering know-how, and sales services. Literature on Cellulube phosphate ester fluids and Celluguard is available.

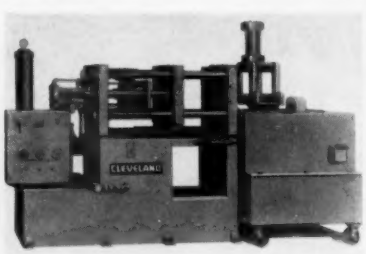
Circle No. 311 on Reader Service Card

CLEARING DIV. U.S. INDUSTRIES 101

. . . is including two trim presses in their exhibit. One is a 32-ton inclinable press with transfer table and 18 month guarantee. The other is a 50-ton hydraulic press.

Circle No. 312 on Reader Service Card

CLEVELAND AUTOMATIC MACHINE CO. 355



. . . is showing a 100-ton die casting machine. This automated hot chamber machine will be making castings at their exhibit.

Circle No. 313 on Reader Service Card

CLIFFORD-ROCKWELL CO 517

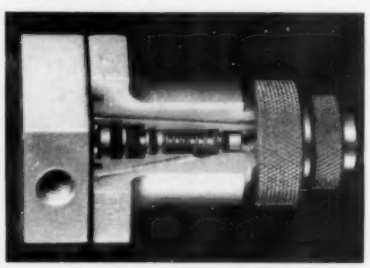
. . . is showing the Hermes line of silicon carbide paper, aluminuous oxide cloth and other metal finishing supplies.

Circle No. 314 on Reader Service Card

COLUMBIA TOOL STEEL 347

. . . has aluminum die casting dies with the cast parts in the die. They are also showing aluminum extrusion dies.

COLUMBUS AUTOMATIC LUBRICATION CO. 425



. . . is showing systems using this spray nozzle for automatic die lubrication from fixed nozzles outside the die.

Circle No. 315 on Reader Service Card

CRUCIBLE STEEL CO. 508

. . . is featuring a 3-dimensional mock-up of typical zinc and aluminum die casting dies.

Circle No. 316 on Reader Service Card

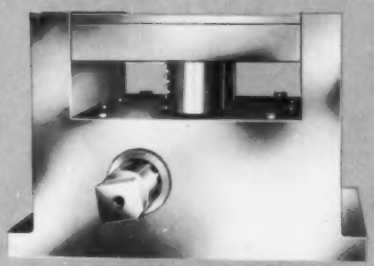
continued on page 75

Custom-designed STANDARDS for

DIE CASTING

STANDARD DIE CAST DIE ASSEMBLIES

32 Standard Sizes
Up to 23¾" x 35½"
Complete interchangeability

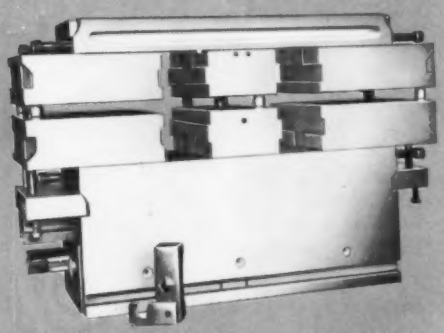


STANDARD Rack and Pinion EJECTOR BOXES

Patented Light-weight Design
15 Standard Sizes

STANDARD UNIT DIES

For Zinc and Aluminum Die Casting
2 Std. Sizes
(Pat. Pend'g)



Water-cooled SPRUE SPREADERS

For Zinc Die Casting

Water-cooled SPRUE BUSHINGS

For Zinc Die Casting

TAPERED CUTTER for Sprue Spreaders

DIE MAKERS
DIE DESIGNERS
DIE CASTERS

DME presents . . .

STANDARDS FOR

Zinc and Aluminum DIE CASTING

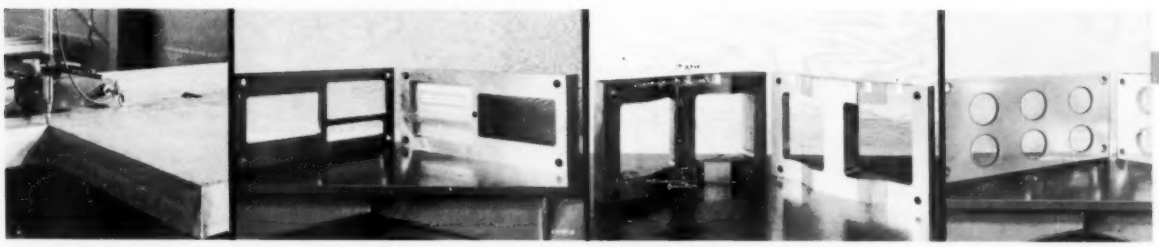
At

BOOTH 321

See reverse side for Floor Plan of National Die Casting Exposition

D-M-E SPECIAL MACHINING SERVICE

Complete facilities for Jig Boring, Pocket Milling, Water Lines and Special Plates



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DETROIT, MICHIGAN

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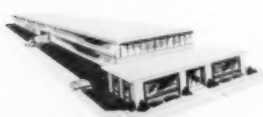
Ejector Pin & Parts Div.
CHARLEVOIX, MICH.



Special Mold Div.
MT. CLEMENS, MICH.

SERVICE

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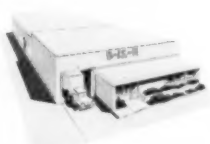

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- Hillside, New Jersey
- Chicago, Illinois
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- Dayton, Ohio
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D-M-E Standard Interchangeability saves you time and money on . . .

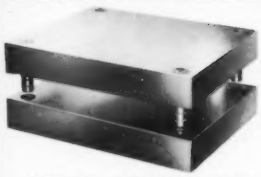
- STANDARD MOLD BASES
- SPECIAL MOLD BASE WORK
- EJECTOR PINS
- MOLD PARTS and SUPPLIES

DETROIT MOLD ENGINEERING CO.

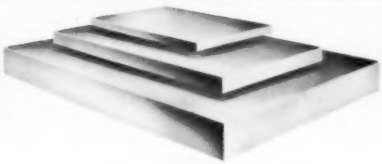
D-M-E CORP. **D-M-E OF CANADA, INC.**

D-M-E STANDARD COMPONENTS

For Plastic Molds and Die Cast Dies



CAVITY RETAINER SETS



MOLD PLATES

Plate thickness ⅞" to 5⅞"—32 Std. Sizes

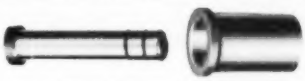
EJECTOR HOUSINGS

One-piece Construction

SPACER BLOCKS

Plain—Slotted—Angle

SUPPORT PILLARS—3 types



LEADER PINS and BUSHINGS

BRASS BAFFLES and ROD

CASCADE WATER JUNCTION

EJECTOR PINS—Hotform or Nitralloy

CORE PINS—3", 6" and 10" Lengths

EJECTOR SLEEVES—4", 6", 8" and 10" Lengths

MOLDMAKERS' TOOLS AND SUPPLIES

Ejector Pin COUNTERBORES

MACHINE REAMERS—Including .005" oversize

Brass FLEX-O-LAPS —⅛" to ¾" Diameter

TAPERED MILLING CUTTERS—½° to 7° Taper per side

HIGH SPEED END MILLS—Two and four flute

LONG DRILLS—For water lines

Leader Pin and Bushing COUNTERBORE

EXTRA LONG SCREWS—Up to 12" in stock

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¼" to ¾" Shoulder Diameter

DOWEL PINS

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MOLD POLISHING COMPOUND

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GUIDE TO NATIONAL DIE CASTING

November 8-11 / Detroit Artiller

TECHNICAL PI

Tuesday, November 8, 9:30 A. M. — 12:00 Noon

SESSION "A" — DIE DESIGN

Moderator: Mr. Stanford Landell, Works Manager, Brown-Lipe-Chapin Div., General Motors Corp.

PAPER 1. MATHEMATICAL DETERMINATION OF DIE DESIGN.
By: Mr. John Caster, Research Staff
Syracuse University Research Foundation

PAPER 2. FURTHER REMARKS ON GATE DESIGN IN ALUMINUM DIE CASTING.
By: Mr. John Lapin, Supt.
Die Casting Operations, Central Foundry Div.
General Motors Corp.

PAPER 2A. A CASE STUDY IN DIE DESIGN FOR ALUMINUM AND MAGNESIUM DIE CASTINGS.
By: The McCulloch Corp.

Tuesday November 8, 1:30 P. M. — 4:00 P. M.

SESSION "B" — DIE BUILDING

Moderator: Mr. John M. Atols, President
Atols Tool & Mold Corp.

PAPER 3. MOLD FABRICATION — COST REDUCTION AND CONTROL.
By: Mr. Rolf H. Berg, V.P. & Treas.
Atols Tool & Mold Corp.

PAPER 4. H-13 STEEL AS USED IN THE DIE CASTING INDUSTRY.
By: Mr. Arthur E. Scholz, Tech. Serv. Engr.,
Customer Tech. Service Dept.,
Crucible Steel Co. of America

PAPER 5. TEMPERATURE RELATED TO MOLDS AND CASTING PROPERTIES.
By: Mr. Ross Dean, Sales Mgr. & Dir.
Sterling, Inc.

Wednesday, November 9, 9:30 A. M

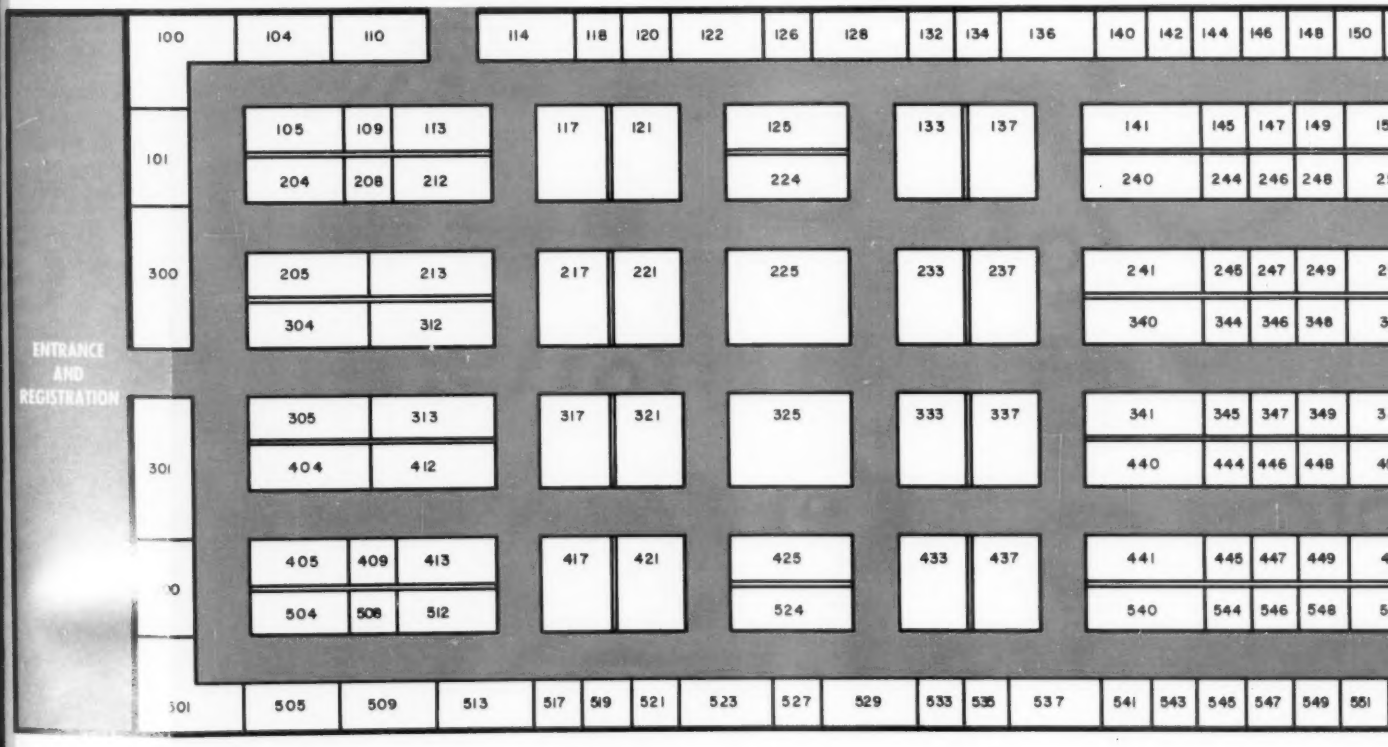
SESSION "C" — METALLURGICAL DE

Moderator: Mr. F. William Foss, Ch. Eng
Apex Smelting Co.

PAPER 6. STUDIES ON THE INFLUE TENT, PRESSURE, AND MA ON THE MECHANICAL PR MINUM DIE CASTINGS.
By: Dr. Werner Ruegg, Head
Labs and Research Dept
Injecta Limited

PAPER 7. ALLOY CONTROL FOR ZI
By: Mr. J. L. Kimberley, Exe
Mr. Ernest W. Horvick,
American Zinc Institute

PAPER 8. METAL HANDLING AND CO
By: Mr. F. William Foss, Chi
Apex Smelting Co.



Precision Me

G EXPOSITION AND CONGRESS

ry Armory / Detroit, Michigan

PROGRAM

0 A. M. — 12:00 Noon

AL DEVELOPMENTS

n. Engr.

**NFLUENCE OF GAS CON-
ND MAGNESIUM CONTENT
AL PROPERTIES OF ALU-
S.**

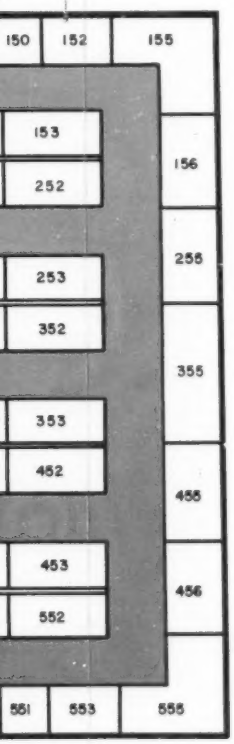
Head, Chem. & Metallurg.
n Dept.

OR ZINC DIE CASTINGS.

y, Exec. V. P., and
vick, Market Dev. Engr.,
titute

ND CONTROL.

s, Chief Engr.,



PAPER 9. METALLOGRAPHY OF DIE CASTING.
By: Mr. G. Leslie Armstrong, Chief Metallurgist, U. S. Reduction Co.

Wednesday, November 9, 1:30 P. M. — 4:00 P. M.

SESSION "D" — WHAT'S AHEAD IN DIE CASTINGS

Moderator: Mr. John Wall, President, Permanent Mold Die Co., Inc.

PAPER 9A. ALUMINUM IN AUTOMOBILE ENGINES.
By: Mr. P. R. Kalischer, Editor, Precision Metal Molding magazine

PAPER 9B. DIE CAST ENGINE DESIGN FOR THE EUROPEAN MARKET.
By: Mr. G. Triulzi, President, A. Triulzi S.A.S.

PAPER 10. VIBRACAST PROCESS AND ULTRASONICS AS APPLIED TO DIE CASTING.
By: Mr. John E. Weber, Gen. Mgr. Southern Die Casting & Engineering Co. and Mr. Earle W. Rearwin, Chief Engr. Die Cast Machines, Reed-Prentice Div., Package Machinery Co.

PAPER 11. PLATING AND ANODIZING OF ALUMINUM DIE CASTINGS.
By: Mr. Robert Harder, President, Lukens Aluminum Co.

Thursday, November 10, 9:30 A. M. — 12:00 Noon

SESSION "E" — COMPETITION TO DIE CASTING

Moderator: Mr. George Hovey, Automotive Rep., L. F. Grammes and Sons, Inc.

PAPER 13. MODERN PERMANENT MOLDING AS A PROCESS FOR THE FOUNDRY.
By: Mr. Frank Ross, Chief Engr., Permanent Mold Die Co., Inc.

PAPER 14. IMPACT EXTRUSIONS TODAY.
By: Mr. James M. Rich, Asst. Prod. Mgr., Aluminum Co. of America

PAPER 15. SAND CASTING PROCESS, A COMPETITOR OF DIE CASTING.
By: Mr. Thomas B. Pfaff, Asst. Foundry Supt., Pontiac Motor Div., General Motors Corp.

PAPER 16. DICTAPHONE EXPERIENCE IN DESIGNING AND ENGINEERING COMPONENTS.
By: Mr. Frederick W. Roberts, V.P. Engrg. & Res., Dictaphone Corp.

PAPER 17. PLASTICS — COMPETITOR OF DIE CASTINGS.
By: Mr. Wm. O. Bracken, Plastics Sales Dev., Cellulose Products Dept., Hercules Powder Co.

Thursday, November 10, 1:30 P. M. — 4:00 P. M.

SESSION "F" — COST AND PROFIT

Moderator: Mr. James T. O'Reilly, Supervisor, Matls. & Equip. Engrg. Dept., Ford Motor Co.

PAPER 18. AUTOMATION AND "MAKE OR BUY".
By: Mr. Lee S. Garretson, Div. Process Liaison Engr., Mfg. Engrg. Dept. and Mr. Tom E. Nadeau, Sr., Die Cast Engr. Mfg. Engrg. Dept., Hardware & Access. Div., Ford Motor Co.

PAPER 19. SHORT RUNS.
By: Dr. D. H. Naffziger, Process Engr., Delco-Remy Div., General Motors Corp.

PAPER 20. ADVANCES IN IMPREGNATION MATERIALS AND TECHNIQUES.
By: Mr. George J. Caudron, V.P., American Metaseal of Detroit

Friday, November 11, 9:30 A. M. — 12:00 Noon

SESSION "G" — QUALITY CONTROL

Moderator: Mr. Clarence Tice, Master Mech., Delco-Remy Div., General Motors Corp.

PAPER 12. HOW CASTINGS AFFECT QUALITY OF ELECTROPLATED DIE CASTINGS.
By: Mr. Wm. H. Safranek, Asst. Chief Electro-Chemical Engineering Div. Battelle Memorial Institute

PAPER 22. EFFECT ON PRODUCT QUALITY OF CAVITY DESIGN, TOOL INSTALLATION AND MACHINE OPERATION.
By: Mr. Earle W. Rearwin, Chief Engineer, Die Cast Machines, Reed-Prentice Div., Package Machinery Co.

PAPER 23. CASTING, TRIMMING AND HANDLING TECHNIQUES FOR OBTAINING QUALITY DIE CASTINGS.
By: Mr. Al Sugar, Field Engr. Cast Master Div., Hydraulic Press Mfg. Co.

PAPER 24. REVIEW OF METHODS TO OBTAIN IMPROVED CORROSION RESISTANCE FOR PLATED ZINC DIE CASTINGS.
By: Mr. Donald R. Millage, Group Leader, and Mr. Edward Romanowski, Res. Chemist, and Dr. Henry Brown, Res. Dir., Udylite Research Corp.

Friday, November 11, 1:30 P. M. — 4:00 P. M.

SESSION "H" — VACUUM IN DIE CASTING

Moderator: Mr. David Morgenstern, President, Lake Erie Industries, Inc.

PAPER 25. VACUUM DIE CASTING — A RESUME OF PROGRESS TO DATE.
By: Mr. Hiram K. Barton, President, Hiram Barton Associates

PAPER 26. SOME EFFECTS OF VACUUM CASTING ON SURFACE FINISH.
By: Mr. E. L. Simpson, Supt., Casting and Molding Dept. Bell & Howell Co.

PAPER 27. USE OF VACUUM IN PRODUCTION OF ANODIZED QUALITY ALUMINUM DIE CASTINGS.
By: Mr. Joseph A. Woltering, V.P., Hamilton Die Cast, Inc.

etal Molding

PMM

EXHIBITORS

404	Acme Mfg. Co.
140	Advance Products Corporation
145	Aldridge Industrial Oils, Inc.
519	Alliance Mold Company, Inc.
353	Aluminum & Magnesium, Inc.
511	American Rotary Tool Company
104	Apex Smelting Company
205	Atols Tool & Mold Corporation
212	Bendix Aviation Corporation (Bendix Foundries Div.)
513	British Industries Corporation (Shaw Process Development Corp. Div.)
501	Buhler Mill Engineering Company
128	The Carborundum Company
142	Celanese Corporation of America
101	Clearing Div. — U. S. Industries
355	The Cleveland Automatic Machine Co.
517	Clifford-Rockwell Company
347	Columbia Tool Steel Company
425	Columbus Automatic Lubrication Co.
508	Crucible Steel Company of America
321	Detroit Mold Engineering Company
301-A	Dodge Steel Company
105	Electric Auto-Lite Company
300	Elox Corporation of Michigan
533	Encyclopedia Britannica
348	John Erler Industries, Inc.
221	Ford Motor Company (Foundry Division)
332	R. H. Freitag Manufacturing Company
341-45	General Motors Corporation
134	Samuel Greenfield Company
225	Greenlee Brothers & Company
344-46	E. F. Houghton Company
120-22	Hydraulic Press Manufacturing Company (Cast Master Division)
500	Industrial Manufacturing Corporation
405	Industrial Publishing Corporation (Precision Metal Molding magazine)
204	Iron Fireman Manufacturing Company
504	Jervis Corporation
448	J. A. Kozma Company
217	Kux Machine Company
241	Latrobe Steel Company
213	Lester-Phoenix, Inc.
304-312	Lindberg Engineering Company
455	Litemetal Dicast, Inc.
132	Magnesium Industries, Inc.
409	Martin Grinding & Machine Works
349	Metal Pumping Services, Inc.
527	Monsanto Chemical Company
126	Morton Mfg. Co.
521	National Lead Company
249	Norman Leach Associates
206	Northern Tool & Die Company
305	Pangborn Corporation
340	Penton Publishing Company (Foundry magazine)
313	Permanent Mold Die Co., Inc.
405	Precision Metal Molding magazine
417	Precision Piston Rings, Inc.
118	Productive Equipment Corporation
109	Prospect Die Mold Company
126	Rebmann Products, Inc.
452	Reed-Prentice, Division of Package Machinery Company
301	Renite Company
317	Rex-Buckeye Company
354	George Sall Metals, Inc.
509	Richard O. Schulz Company
425	G. W. Smith & Sons Company, Inc.
110	Society of Die Casting Engineers, Inc.
440	Southern Die Casting & Engineering Co.
444	Sterling, Inc.
413-512	F. B. Stevens, Inc.
153	Ternstedt Division of General Motors Corp.
156-255	A. Triulzi S.A.S.
121	Udylite Corporation
115	Union Steel Stamp & Die Engravers, Inc.
541	U. S. Department of Labor
224	U. S. Reduction Company
114	Univertical Corporation
544	Vesuvius Crucible Company
535	Wayne State University
537	Wolverine Die Cast Company
346	Fred C. Ziesenheim, ME

GUI

Nov

Tuesday, N

SESSION "A" —

Moderator: Mr. S
Brow

PAPER 1. MATH
DESI
By: M
S

PAPER 2. FURT
ALUM
By: M
D
G

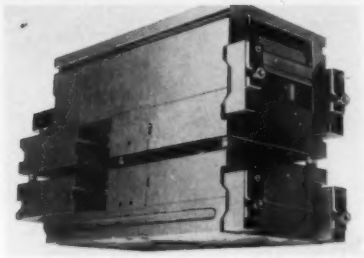
PAPER 2A. A CA
AND
By: T

ENTRANCE AND REGISTRATION

P

EXHIBITORS *continued*

DETROIT MOLD ENGINEERING CO. 321



. . . is exhibiting their standard unit dies for zinc and aluminum die castings. These dies have interchangeable replacement units.

Circle No. 317 on Reader Service Card

ELECTRIC AUTOLITE CO. 105

. . . has automotive castings, both ornamental and functional at their exhibit. These castings range in size from small name plates to radiator grills.

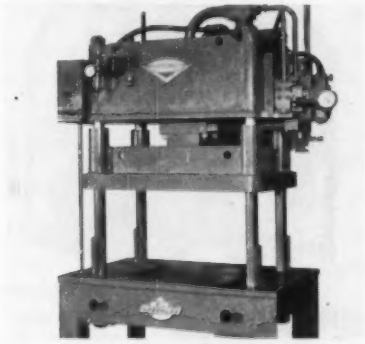
Circle No. 318 on Reader Service Card

FORD MOTOR CO. 221

. . . is showing the die castings used on their automotive products, from small castings to large transmission housings.

Circle No. 319 on Reader Service Card

GREENLEE BROS. & CO. 225



. . . is including this B & T trim press in their exhibit. The press features 4-tie bar design with a hydraulically actuated platen.

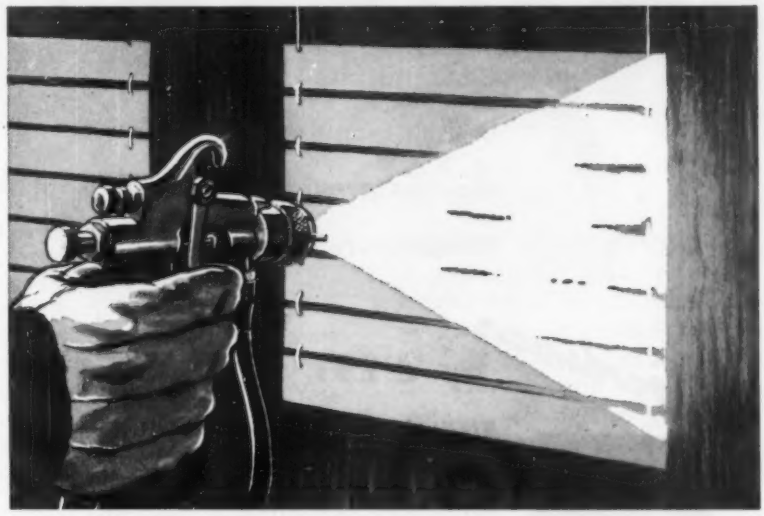
Circle No. 320 on Reader Service Card

continued on page 76

To avoid spray booth troubles

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 SERVICE MEN • OVER 160 MATERIALS



Oakite curtain water treatment takes the "tack" out of overspray

Just a few inexpensive ounces of the right Oakite additive in the spray booth water curtain save hours of clean-up time. The reason: Oakite chemicals surround each droplet of paint with an "anti-stick" film that keeps spray from adhering to walls, pumps, lines and water nozzles. Paint that doesn't settle or float immediately will still wash through the system—but it won't stick, won't clog the sprays. The result: a water curtain without gaps, a smooth running system, *no* unplanned downtime.

There's a full line of Oakite water additives . . . one to match any of the countless paints, enamels and organic coatings. The *right* one will help paint sink to the sump . . . or float to the surface for skimming off . . . or overcome special hard water troubles . . . or combat foaming problems. What's *your* problem? Ask the Oakite man to make free tests in your paint spray booth. They won't interfere with production. They may save you hours of spray booth downtime. Bulletin F-9443 tells more. Write Oakite Products, Inc., 28A Rector St., New York 6, N. Y.

it PAYS to ask Oakite

OAKITE

over 50 *Est. 1909* SCIENCE

years' leadership in industrial cleaning

Circle No. 80 on Reader Service Card

Gardsman by WEST

STEPLESS Controllers (Model JSB) infinitely modulate electric heat. No on-off pulses. Prolongs heater-life, saves power. Exclusive manual switch, adjustable maximum and minimum input control. *Tubeless.* Compact. Least maintenance and operating attention required.

PROGRAMMER (Model JSBG Stepless) for the most *precise* control of temperature-time cycle, integrated by simply cut cam. Most compact. Can also control secondary operation at any point in the time cycle. Program Controllers are also available with other control forms:— (Off-On, Proportioning, etc.) Ask your West representative or write direct for Bulletins JSB and JG.

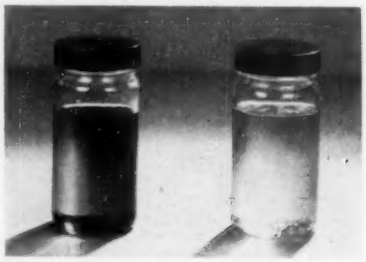
WEST Instrument CORPORATION
SALES OFFICES IN PRINCIPAL CITIES
4357-D W. MONTROSE, CHICAGO 41, ILL.
British Subsidiary:
WEST INSTRUMENT LTD.,
52 Regent St., Brighton 1, Sussex
Represented in Canada by Davis Automatic Controls, Ltd

the trend is to WEST

Circle No. 78 on Reader Service Card

EXHIBITORS *continued*

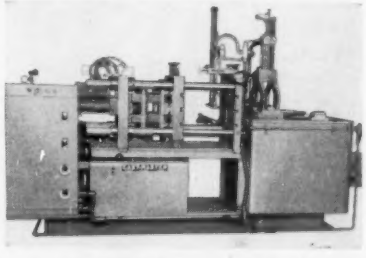
E. F. HOUGHTON & CO. 344



. . . is featuring the Houghto-Safe hydraulic fluids. In their display they will spray Houghto-Safe against a flaming burner to demonstrate how this fluid makes die casting safer.

Circle No. 321 on Reader Service Card

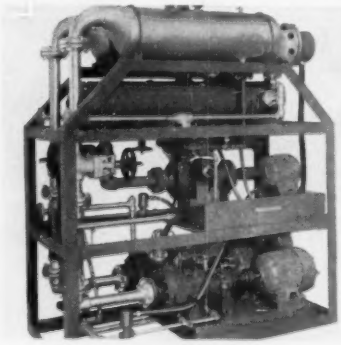
HYDRAULIC PRESS MFG. CO. 120



. . . is displaying a Cast-Master die casting machine and a bench type H-P-M C-Press for trimming die castings. The die casting machine is a 100-ton, automatic, hot chamber model.

Circle No. 322 on Reader Service Card

INDUSTRIAL MFG. CORP. 500



. . . is showing this Thermolator automatic die temperature control unit which maintains proper die temperature for permanent mold or die casting zinc, magnesium, aluminum and other metals.

Circle No. 323 on Reader Service Card

continued on page 78

REED-PRENTICE

DIE CASTING NEWSLETTER

Hood or 'hoodless' vacuum die casting ...which offers you more?

Within the past few years interest in vacuum die casting has grown to a point where few, if any, major companies have not at least considered it. On both hot and cold chamber machines, the results that can be consistently obtained with vacuum operation have proved its worth.

Now one of the main questions is: What type of system should I buy? What advantages does the use of a hood, with the die moving in a vacuum, have over the 'hoodless' systems which evacuate the die after closure.

Variations with 'hoodless'

Reducing and holding air pressure at a predetermined level is extremely difficult without the aid of a hood. Even the use of very high vacuum to offset leakage across the die face offers no guarantee of consistency from shot to shot.

One general result is a degree of variation in metal flow which can affect both the surface finish and density of castings.

The use of a hooded system, where the vacuum is pulled *before* the die is closed, can eliminate such variables. This is the case in both the VACUCAST (zinc) and VACUFEED (aluminum) systems which have been developed by REED-PRENTICE.

More uniform operation

With a constant casting temperature, uniform evacuation is achieved on each shot with lower vacuums. This in itself helps assure a more completely uniform metal flow, an extremely important factor in the successful production of larger, thin walled castings that only vacuum operation makes possible.

This ability to handle difficult shots on either the VACUCAST or VACUFEED will continue to broaden die casting's uses. The design engineer can specify vacuum casting with confidence . . . the die caster knows he has far greater latitude in the jobs he can undertake.

Close-up of VACUFEED (aluminum) machine shows how the compact hood completely encloses the die area to offset leakage, protect operator against flash.

Die conversion, design

It is usually far simpler to convert existing dies to use in a hooded system. No provision need be made to eliminate leakage of air across the face, since the entire die operates within a vacuum. While gating must sometimes be altered, it is often possible to follow practices that would be impossible with standard equipment and are to the user's advantage.

Design of new dies for vacuum use with the REED-PRENTICE system can be simpler. The fact that it is better to design to one standard die thickness helps reduce set-up time.

Other advantages

In day-to-day operation, REED-PRENTICE vacuum equipment offers many benefits beyond obvious user advantages like the reduction of rejects. Zinc parts cast on VACUCAST machines can have superior surface and plating properties. On the VACUFEED, with its automatic ladling, it is practical to cast with aluminum alloys that cannot be used on standard equipment. Parts are cleaner, lighter, need less finishing.

First and foremost, this complete equipment is manufactured only by REED-PRENTICE. If you would like full details on either the zinc or aluminum vacuum system . . . how it can be applied to your operation . . . contact your nearest REED-PRENTICE Sales Engineer today.

REED-PRENTICE
.....division of
EAST LONGMEADOW, MASSACHUSETTS
PACKAGE MACHINERY COMPANY
BRANCH OFFICES: NEW YORK • CHICAGO • BUFFALO • CLEVELAND • DEARBORN • KANSAS CITY • LOS ANGELES
Circle No. 64 on Reader Service Card

Synclinal Sump Type

Capacities:
5—8—10—20—30—50—75 and 100 G.P.M.

Pipe Sizes:
¾"—1"—1¼"—1½"—2"—2½" and 3".

Connections:
Coupling—Male Nipple.

By-pass Valve:
Not Available.

Synclinal Line Type

Capacities:
5—8—10—20—30—50—75 and 100 G.P.M.

Pipe Sizes:
¾"—1"—1¼"—1½"—2"—2½" and 3".

By-pass Valve:
Not available.

Operating Pressures:
Up to 80 p.s.i.

Bonded Line Type

Capacities:
10—20—30—50 and 75 G.P.M.

Pipe Sizes:
1"—1¼"—1½"—2" and 2½".

By-pass Valve:
Available with or without.

Operating Pressure:
Up to 250 p.s.i.

Operating Temperatures:
Up to 300° F.

MARVEL
SYNCLINAL FILTERS

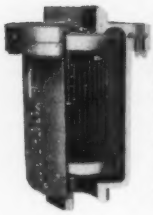
For DEPENDABLE PROTECTION on all Hydraulic and other low pressure circulating systems

Designed to give more ACTIVE filtering area—MORE dependable protection—MORE productive operation before cleaning is necessary. *Meet J.I.C. Standards.*

FILTERING MEDIA in all Marvel Filters is Monel wire cloth available in mesh sizes of 30-40-50-60-80-100-150 and 200 to meet your degree of filtration requirement.

EASY TO CLEAN—All Marvel Filters are easy to clean. Line type units operate in any position and may be serviced without disturbing pipe connections.

OVER 900 O. E. M's. install Marvel Filters as Standard Equipment.



In-Line Filter

Capacities:
Up to 60 G.P.M.

Pipe Sizes:
¾"—1"—1¼" and 1½" (at both inlet and outlet).

By-pass Valve:
Available with or without.

Tandem Sump Type

Capacities:
10—16—20—40—60—100—150 and 200 G.P.M.

Pipe Sizes:
¾"—1"—1¼"—1½"—2"—2½" and 3".

Connections:
Coupling—Male Nipple.

By-pass Valve:
Not available.

Bonded Sump Type

Capacities:
10—20—30—50 and 75 G.P.M.

Pipe Sizes:
1"—1¼"—1½"—2" and 2½".

Connections:
Coupling—"O" Ring—Male Nipple.

By-pass Valve:
Available with or without.

IMMEDIATE DELIVERY

A phone call can get your shipment on its way TODAY!

For further information on a specific type filter—Write—wire or phone

MARVEL ENGINEERING COMPANY
7227 N. Hamlin Ave., Chicago 45, Ill.
Phone: JUniper 8-6023

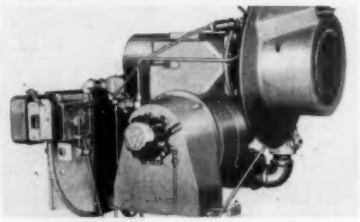
Please send me information on Marvel Filters as indicated: PMM-11

☐ Hydraulic Oils ☐ Coolants ☐ Lubricants ☐ Fire Resistant Fluids
☐ Water ☐ Sump Type ☐ Line Type ☐ In-Line

Name_____
Company_____
Address_____
City_____ State_____

EXHIBITORS *continued*

IRON FIREMAN MFG. CO. 204



. . . is showing industrial package burners such as this one for die casting metal melting. It is fired by gas or oil.

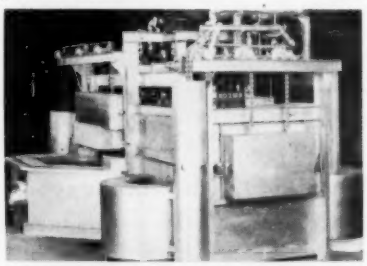
Circle No. 324 on Reader Service Card

JERVIS CORP. 504

. . . is displaying die castings of both aluminum and zinc used in the automobile, appliance, marine, and plumbing fields.

Circle No. 325 on Reader Service Card

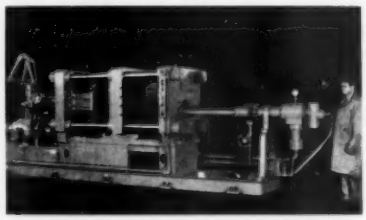
J. A. KOZMA CO. 448



. . . is exhibiting this radiant aluminum melting and holding furnace. A hydraulically operated ladle is also being shown.

Circle No. 326 on Reader Service Card

KUX MACHINE CO. 141



. . . has this 500-ton cold chamber die casting machine at their exhibit. The machine has the "Vac-U-Die" vacuum system.

Circle No. 327 on Reader Service Card

LATROBE STEEL CO. 241

. . . is showing desegatized high speed steels, free-machining die steels, and other high-strength, high-temperature alloys.

Circle No. 328 on Reader Service Card

continued on page 80

V-R Investment Castings...

Intricate shapes...

Do your specifications call for parts that are too complex to machine profitably? Then you should invest a little time with us to hear about V-R Investment Castings. Our method of investment casting accurately reproduces odd-shaped parts that are uneconomical to machine in large quantities. This allows your engineers greater design freedom because it eliminates secondary operations. Material is no problem either . . . parts can be cast from Tantung, steel, beryllium copper, stainless steels and many other materials. Send us a sample or, better yet, a parts drawing. We'll give you the *complete story* on V-R Investment Castings.

CREATING THE METALS THAT SHAPE THE FUTURE

VASCOLOY-RAMET

826 MARKET STREET WAUKEGAN, ILLINOIS

I-797

Circle No. 75 on Reader Service Card

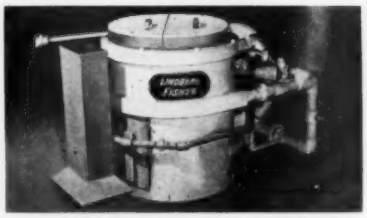
EXHIBITORS *continued*

LESTER-PHOENIX, INC. 213

. . . is displaying a 125-ton automatic zinc die casting machine capable of 1000 free cycles per hour.

Circle No. 329 on Reader Service Card

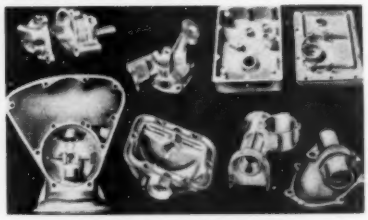
LINDBERG ENGINEERING CO. 304



. . . includes in their display this radiant wall holding furnace which prevents direct flame impingement on the crucible and has low fuel consumption.

Circle No. 330 on Reader Service Card

LITEMETAL DICAST INC. 455



. . . is exhibiting some of their aluminum and magnesium die castings which illustrate effective use of the die casting method for material, labor, and weight saving.

Circle No. 331 on Reader Service Card

MARTIN GRINDING & MACHINE WORKS INC. 409

. . . is showing die casting machine accessories including cold chambers, steel and beryllium copper plunger tips, and goosenecks.

Circle No. 332 on Reader Service Card

MONSANTO CHEMICAL CO. 527

. . . has as the theme for their exhibit that Pydraul fluids are double acting in die casting machines—they have built-in fire resistance and lubricity.

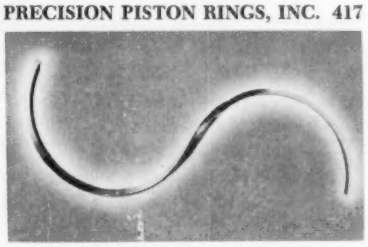
Circle No. 333 on Reader Service Card

PANGBORN CORP. 305

. . . is displaying an air cushioned vibratory finishing machine for descaling, deburring, radiusing, and other finishing operations.

Circle No. 334 on Reader Service Card

PRECISION PISTON RINGS, INC. 417



. . . is exhibiting unbreakable, tempered, and treated stainless steel die casting plunger rings which last up to 10 times longer than ordinary rings.

Circle No. 335 on Reader Service Card

As the world's largest lead-zinc producer, we can make prompt delivery when you order electrolytically refined TADANAC Brand Special High Grade zinc. Our production is geared to meet punctually your requests for TADANAC Brand Special High Grade formulated to your specifications.

TADANAC Brand Special High Grade zinc slabs have recently been redesigned with strapping slots and hand-holds so they will travel better and be easier to handle.

All TADANAC Brand zinc is electrolytically refined to give die-casters a consistently high quality product, for greater design flexibility, more exacting dimensional tolerances and better finishes.

Cominco's Technical Service staff has had broad experience in the die-casting field and will be glad to help you get the very best castings from TADANAC Brand zinc.

Buy TADANAC Brand zinc for convenience, quality and service.

COMINCO

THE CONSOLIDATED MINING AND SMELTING COMPANY OF CANADA LIMITED
Toronto WORLD'S LARGEST LEAD-ZINC PRODUCER Montreal

Tadanac Brand Metals are sold in United States by American Metal Climax, Inc., New York, Chicago, Detroit, Los Angeles

0167

Circle No. 21 on Reader Service Card

PRODUCTIVE EQUIPMENT CORP. 118

. . . has in action a small selectro vibro-finisher cleaning up die castings and showing the before and after condition.

Circle No. 336 on Reader Service Card

REED-PRENTICE DIV. 452

. . . is displaying a variety of complex zinc and aluminum die castings made on Reed-Prentice machines, including vacuum produced die castings which have been color anodized.

Circle No. 337 on Reader Service Card

RENITE CO. 301

. . . is showing their Renite die lubricants and releasing agents, as well as the equipment for applying them.

Circle No. 338 on Reader Service Card

GEO. SALL METALS CO. 354

. . . is stressing the importance of superior ingot quality and good customer service in producing high quality castings.

Circle No. 339 on Reader Service Card

R. O. SCHULZ CO. 509

. . . has a display showing castings made from dies they have produced. These include automotive and appliance components.

Circle No. 340 on Reader Service Card

SHAW PROCESS DEVELOPMENT CORP. 513

. . . is showing how to make low cost die casting dies more rapidly by using the Shaw casting process.

Circle No. 341 on Reader Service Card

G. W. SMITH & SONS, INC. 425

. . . is exhibiting a complete line of die release compounds for every alloy type and casting condition.

Circle No. 342 on Reader Service Card

SOUTHERN DIE CASTING & ENGINEERING 440

. . . is announcing their new Vibrocast process for increasing the tensile strength of die cast products.

Circle No. 343 on Reader Service Card

continued on page 86

Circle No. 33 on Reader Service Card

REJECTS knocking your profits for a loop?

The alloys you're using may be at fault—For good casting results your alloys must fulfill a considerable number of specific requirements, PLUS all the particular qualities to meet YOUR casting needs.

See how HB&S start-to-finish quality controls guarantee alloys always 100% "on spec" . . . write TODAY for Henning's "Reference Book and Guide on Zamak (Zinc Base) Die Casting Alloys". It's yours for the asking.

YOUR CASTINGS CAN BE NO BETTER THAN THE ALLOYS YOU USE

HENNING BROS. & SMITH, INC.

Dependable service since 1922
91-117 SCOTT AVE., AT RANDOLPH ST.
BROOKLYN, N. Y.
Smelters and Refiners of Aluminum, Bronze, Brass, Zinc, Lead

Bobinchuck Machine and Tool Company

Designers and builders of die casting dies and plastic molds.

From the largest to the smallest

CALL Diamond 1-6336

BOBINCHUCK MACHINE & TOOL CO.
9202 RENO AVENUE • CLEVELAND 5, OHIO

Circle No. 99 on Reader Service Card

Card Invalid Without Company Name

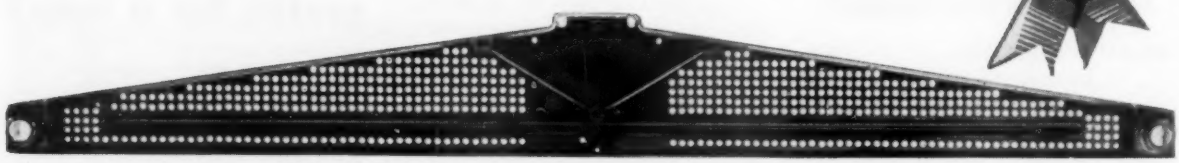
KUX MACHINE CO.

SALUTES

A&A die casting company

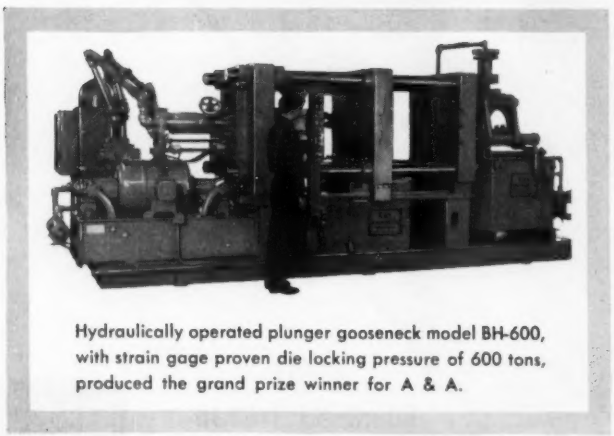
. . . top winner of the New Jersey Zinc Co.

"Zinc Die Casting of the Year" Award



A & A's $1,000-AWARD CASTING—THIS 6-LB. 32-INCH VACUUM CHAMBER FOR AMPEX DIGITAL TAPE HANDLER. CAST AT A SAVING OF 95% OVER PREVIOUS PRODUCTION METHOD.

CONGRATULATIONS TO A & A on their achievement of manufacturing this exceptional wave guide die casting. The casting, having an unprecedented 515 cored holes, was made to the most exacting requirements and tolerances. Two slots running almost the entire 32 inches of casting length are only .007 inches wide, and a flatness within .002 inches end to end is achieved as specified. A perfect cast finish is also a must, as the part is hard chrome plated for wear resistance.



Hydraulically operated plunger gooseneck model BH-600, with strain gage proven die locking pressure of 600 tons, produced the grand prize winner for A & A.

KUX IS PROUD, TOO—TO HAVE HELPED! To solve this and other difficult problems in precision die-casting, Victor Anderson and John Allen, founders of A & A Die Casting Company make almost exclusive use of many different models and sizes of Kux machines with their built-in engineering superiorities.

Write for full details of the 28 all-new KUX models illustrated in the latest KUX Die Casting Machine Catalog.

SEE US AT BOOTH NO. 141-143 NATIONAL DIE CASTING EXPOSITION

KUX MACHINE CO. • 6725 NORTH RIDGE • CHICAGO 26, ILLINOIS

Circle No. 47 on Reader Service Card

READER SERVICE CARD...

PMM

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PLEASE PRINT

November 1960. Do not use after Feb. 15, 1961

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Street .....

City ..... Zone ..... State .....

Please send me additional information and literature on items circled below.

1	19	37	55	73	91	109	127	145	163	181	199	217	235	253	271	289	307	325	343	361	379	397
2	20	38	56	74	92	110	128	146	164	182	200	218	236	254	272	290	308	326	344	362	380	398
3	21	39	57	75	93	111	129	147	165	183	201	219	237	255	273	291	309	327	345	363	381	399
4	22	40	58	76	94	112	130	148	166	184	202	220	238	256	274	292	310	328	346	364	382	400
5	23	41	59	77	95	113	131	149	167	185	203	221	239	257	275	293	311	329	347	365	383	401
6	24	42	60	78	96	114	132	150	168	186	204	222	240	258	276	294	312	330	348	366	384	402
7	25	43	61	79	97	115	133	151	169	187	205	223	241	259	277	295	313	331	349	367	385	403
8	26	44	62	80	98	116	134	152	170	188	206	224	242	260	278	296	314	332	350	368	386	404
9	27	45	63	81	99	117	135	153	171	189	207	225	243	261	279	297	315	333	351	369	387	405
10	28	46	64	82	100	118	136	154	172	190	208	226	244	262	280	298	316	334	352	370	388	406
11	29	47	65	83	101	119	137	155	173	191	209	227	245	263	281	299	317	335	353	371	389	407
12	30	48	66	84	102	120	138	156	174	192	210	228	246	264	282	300	318	336	354	372	390	408
13	31	49	67	85	103	121	139	157	175	193	211	229	247	265	283	301	319	337	355	373	391	409
14	32	50	68	86	104	122	140	158	176	194	212	230	248	266	284	302	320	338	356	374	392	410
15	33	51	69	87	105	123	141	159	177	195	213	231	249	267	285	303	321	339	357	375	393	411
16	34	52	70	88	106	124	142	160	178	196	214	232	250	268	286	304	322	340	358	376	394	412
17	35	53	71	89	107	125	143	161	179	197	215	233	251	269	287	305	323	341	359	377	395	413
18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	378	396	414

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12	30	48	66	84	102	120	138	156	174	192	210	228	246	264	282	300	318	336	354	372	390	408
13	31	49	67	85	103	121	139	157	175	193	211	229	247	265	283	301	319	337	355	373	391	409
14	32	50	68	86	104	122	140	158	176	194	212	230	248	266	284	302	320	338	356	374	392	410
15	33	51	69	87	105	123	141	159	177	195	213	231	249	267	285	303	321	339	357	375	393	411
16	34	52	70	88	106	124	142	160	178	196	214	232	250	268	286	304	322	340	358	376	394	412
17	35	53	71	89	107	125	143	161	179	197	215	233	251	269	287	305	323	341	359	377	395	413
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18	36	54	72	90	108	126	144	162	180	198	216	234	252	270	288	306	324	342	360	378	396	414

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THE FOLLOWING WOULD LIKE TO GET PMM EACH MONTH:

DO NOT WRITE IN THESE SPACES

P 1
JOB
SIC
P 2
P 3
PER

Name _____ Position _____

Name _____ Position _____

Company _____

Address _____

_____

Major Products made at this address: _____

THIS PLANT (USES) (PRODUCES) ☐ ☐ TYPES OF PARTS CHECKED BELOW:

- ☐ Die Castings
- ☐ Extrusions
- ☐ Investment Castings
- ☐ Powder Metal Parts
- ☐ Permanent Mold Castings
- ☐ Plaster Mold Castings
- ☐ Shell Mold Castings
- ☐ None of these

PMM

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DATA OFFERED IN THIS MONTH'S ADS

Qualified readers may obtain any of these free reference materials by circling the numbers on the Reader Service Cards facing page 82

1. **Die Lubricant**—Acheson Colloids Co.—Technical bulletin—on semi-colloidal and colloidal dispersions for dies and other abrasive, high temperature and pressure uses.

3. **Tool Steels**—Allegheny Ludlum Steel Corp.—Booklet—describes the Steelector method for selecting the tool steel that meets your particular requirements.

7. **Die Castings**—American Smelting & Ref. Co. —Technical information —on electrolytically refined high grade zinc and other alloys for die casting.

9. **Die Casting Alloy**—Apex Smelting Co.—Booklet—shows the compositions, properties, and other data on Apex die casting alloys.

10. **Investment Casting**—Arwood Corp.—44-page booklet—"Practical Guide to Investment Casting."

14. **Compacting Presses**—Baldwin-Lima-Hamilton Corp.—Technical data—on compacting press for high density, close tolerance parts.

16. **Clipping Press**—B. I. P. Engineering Ltd.—Technical data—on a 34-ton, hydraulic trimming press.

17. **Die Casting Machine**—DCMT Sales Corp., Div. British Industries Corp.—Literature—on DCMT Mac 99 automatic cycling die casting machine with 15 tons locking force.

18. **Investment Casting**—Shaw Process Development Corp.—56-page booklet—describes the Shaw Process for the precision casting of large pieces such as die casting dies.

19. **Die Casting Machines**—Eric P. Cahn—Bulletin—describes a line of die casting machines of from 75 to 1200 tons capacity.

20. **Die Casting Machines**—Cleveland Automatic Machine Co.—Catalog —describes a complete line of die casting machines.

22. **Die Casting Dies**—Crucible Steel Co. of America—Technical data—on CSM 2 tool steel which eliminates the heat treatment of most zinc die casting dies because of its uniform hardness.

23. **Die Casting Dies**—Damen Tool & Engineering Co., Inc.—Brochure—shows their facilities for making die casting dies.

24. **Dies & Molds**—Delaware Machinery and Tool Co.—8-page brochure shows equipment and facilities for making die casting dies.

25. **Crucibles**—Denver Fire Clay Co. —Catalog—gives full information on a line of crucibles and funnels for the casting industry.

28. **Die Castings**—Dollin Corp.—16-page brochure—shows their facilities for making zinc and aluminum die castings.

30. **Metal Powder**—The Glidden Co.—Technical literature—describes the Resistox Metal Powders that are prepared by a special process which removes all soluble salts.

31. **Zinc Die Castings**-Gries Reproducer Corp.—Bulletin—describes tiny zinc parts made by die casting.

32. **Castings**—Hampden Brass & Aluminum Co.—Brochure shows their facilities for permanent mold and die casting.

33. **Zinc Alloys**—Henning Bros. & Smith—Technical booklet—tells how to select zinc base die casting alloys.

35. **Investment Casting**—Hitchiner Mfg. Co.—13-page booklet—explains the ceramic shell investment casting process and shows Hitchiner's facilities.

38. **Fire-Resistant Fluids**—E.F.Houghton & Co.—48-page handbook—tells how to select and use fire-resistant hydraulic fluids and compatible packings.

42. **Die Cooling**—Industrial Mfg. Corp. —Brochure—describes a unit for cooling permanent mold and die casting dies.

45. **Aluminum Alloy**—Kaiser Aluminum—Booklet—offered to foundry officials gives complete information on a new, high-strength, high-purity aluminum alloy, includes list of production advantages.

47. **Die Casting Machines**—Kux Machine Co.—Catalog—describes a complete line of die casting machines.

49. **Die Steel**—Latrobe Steel Co.—Data sheet—on an H-13 steel for die casting dies.

53. **Metallurgical Services**—Metal Control Laboratories—Brochure—describes their metal testing and research services, includes price lists.

58. **Sinterings**—New Jersey Zinc Co. —Technical manual—tells how to design for pressed brass and nickel silver metal powder parts.

59. **Die Castings**—Paramount Die Casting Co.—Design booklet—tells how to design die castings.

60. **Trim Presses**—Hannifin Company —Bulletin—describes high speed, hydraulic trimming presses.

61. **Mold Lubrication**—Pierce-Waller Inc.—Data sheet—on the Air-Lube system for cleaning and lubricating mold and die surfaces.

63. **Plunger Rings**—Precision Piston Rings, Inc.—Information—on unbreakable stainless steel die casting plunger rings.

65. **Sinterings**—Reese Metal Products Corp.—16-page booklet—tells how to cut precision parts costs with the Remet powdered metal process.

66. **Pattern Wax**—Alexander Saunders & Co.—Graph—shows the expansion and cooling curves for a tough, durable pattern wax with a low coefficient of expansion.

69. **Ladles**—Spincraft, Inc.—Data and prices—on stainless steel ladles of non-spill design which are 75% lighter than cast iron models.

71. **Compacting Press**—F. J. Stokes Corp.—Bulletin—describes a 50-ton, multiple motion, powder metal press.

74. **Fire-Resistant Fluids**—Union Carbide Chemicals Co.—Booklet—"UCON Hydrolubes Spell Safety," tells how to protect your plant with fire-resistant fluids.

78. **Temperature Control**—West Instrument Corp.—Bulletins—describe a stepless controller and programmer for precise temperature control.

79. **Metal Finishing**—Almco Queen Products Div.—Catalog—describes the latest metal finishing machines, methods, and media.

80. **Spray Painting**—Oakite Products, Inc.—Bulletin—describes additives for your spray booth water curtain that saves hours of clean-up time.

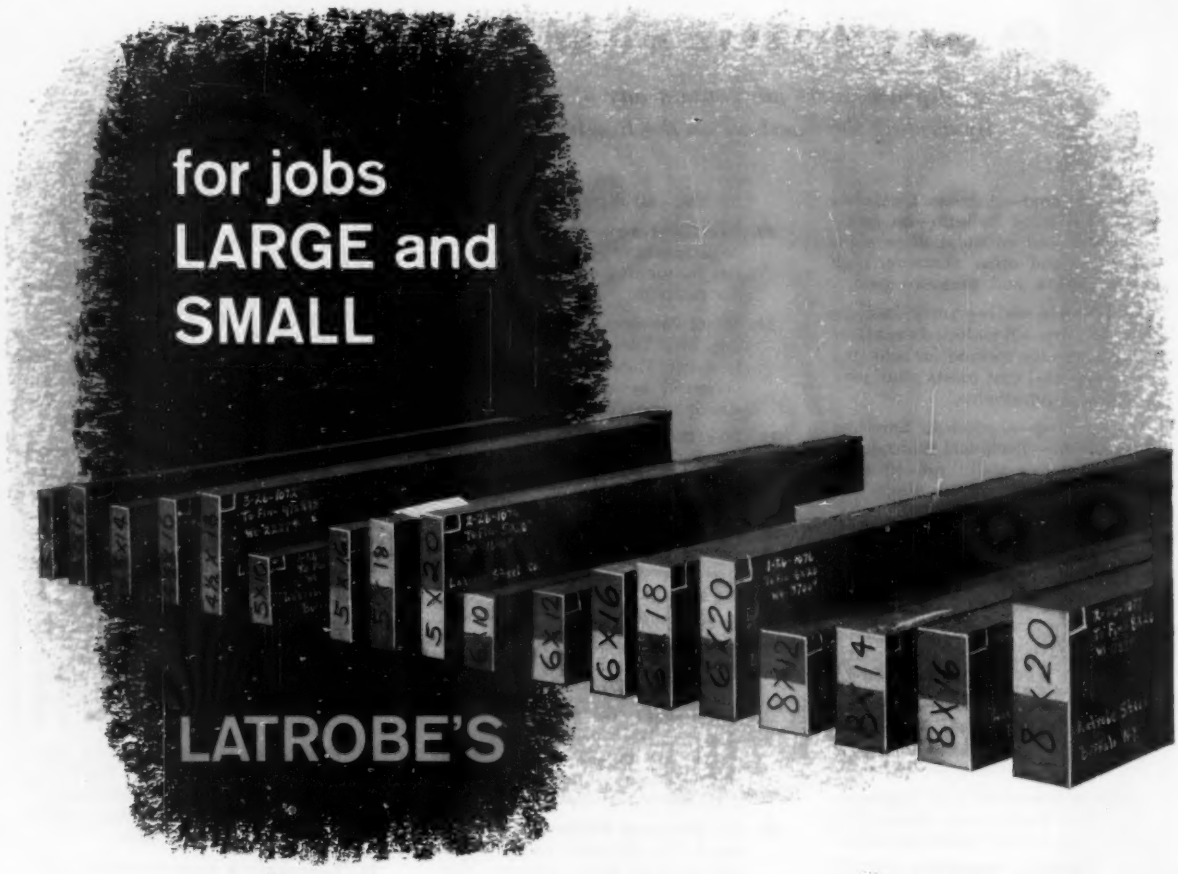
95. **Polishing & Grinding**—Engis Equipment Co.—Illustrated price list—describes the Di-Profiler for polishing and grinding hard-to-reach surfaces.

96. **Die Casting Dies**—Richards Tool & Mold Co.—Information—on how their Master-Molds eliminate expensive die sets and other costs.

100. **Die Castings**—Hamilton Diecasting Corp.—Brochure—describes facilities for manufacturing zinc and aluminum die castings also vacuum equipment used.

105. **Drilling & Tapping Head**—Errington Mechanical Laboratory, Inc.—Literature—describes a drilling and tapping head which is adjustable to any hole pattern.

111. **Die Steel**—Universal-Cyclops Steel Corp.—Data—on a vacuum degassed die casting die steel said to give longer production runs.



VDC Die Casting Die Steel

. . . stocked to meet your size requirements

Send for VDC data sheet

Latrobe's VDC (Type H-13) die steel is regularly stocked at nearby Latrobe Steel Service Centers to meet practically all your die size requirements—large and small.

Regardless of die intricacy, you can always depend on VDC to give the ultimate in production. It is free from porosity and has superior impact strength . . . it is easy to machine, possesses excellent non-deforming properties and can be uniformly hardened to give excellent resistance to wash and erosion in service. VDC has a high vanadium content for magnesium or aluminum die casting service in temperature ranges up to 1200°F.

Call your nearby Latrobe Steel Service Center today . . . specify VDC for your next die casting die.

Manufactured by skilled American Labor

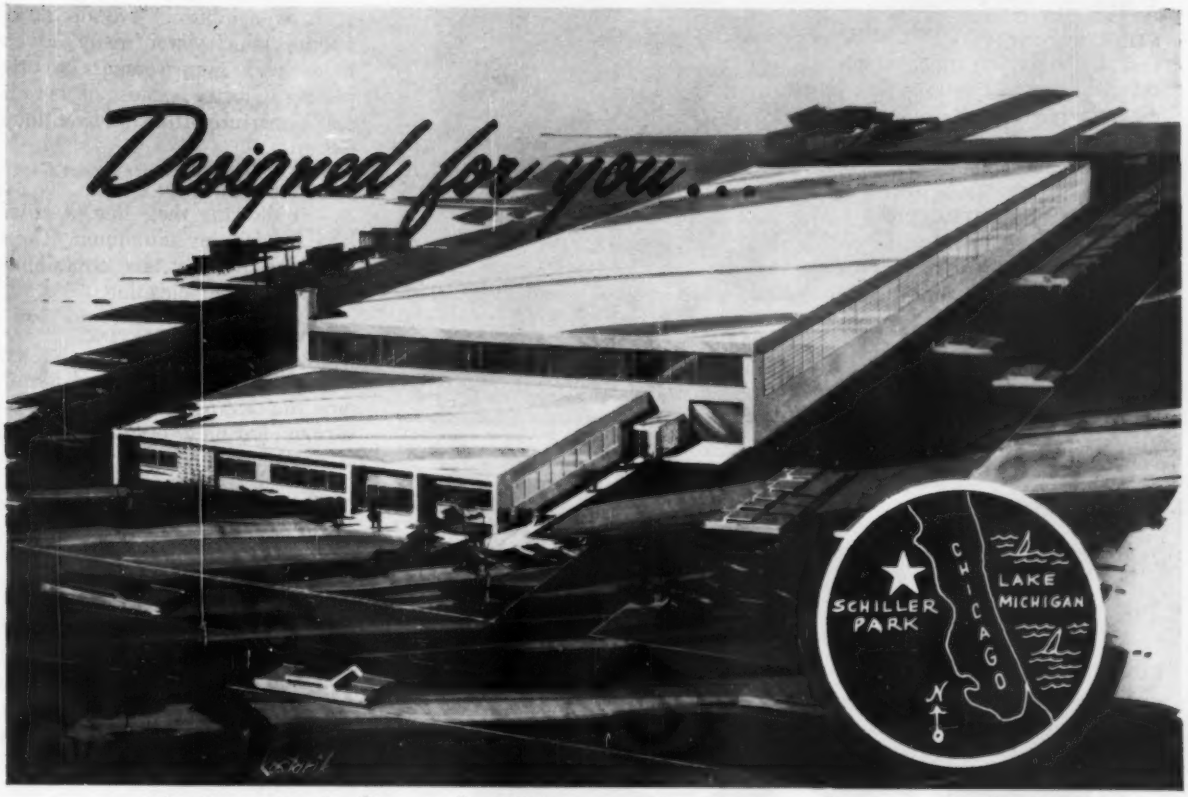
LATROBE
Metalmasters

LATROBE STEEL COMPANY

LATROBE, PENNSYLVANIA

BRANCH OFFICES AND STEEL SERVICE CENTERS: BOSTON • BUFFALO • CHICAGO CLEVELAND • DAYTON • DETROIT • GRAND RAPIDS • HARTFORD • LOS ANGELES • MIAMI MILWAUKEE • NEW YORK • PHILADELPHIA • PITTSBURGH • SAN LEANDRO • TOLEDO

Circle No. 49 on Reader Service Card



with America's finest facilities, equipment and men producing America's highest quality molds for the Die-Casting and Plastics Industries

ATOLS
Ultra-Precision
MOLDS

Yes, an all new plant, doubling previous floor area and increasing traveling crane capacity to 20 tons, equipped with the industry's most advanced tools, yet staffed by the same experienced men who have earned the praise of the nation's leading blue chip companies. We are proud of our new building but we take even greater pride in that many of the same companies whom we served at the very beginning of ATOLS are still our most valued customers. We dedicate our building to them and to those of you who take advantage of our invitation to investigate our facilities, our skill, our service.

For more than 25 years ATOLS has designed and produced precision made molds promptly and economically. We offer a complete service from design and engineering to the finished mold, with more than 100 men to serve you.

For complete details of our services and facilities, simply call or write. Your request will be answered promptly and courteously.

ATOLS TOOL and MOLD CORPORATION

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Circle No. 11 on Reader Service Card

EXHIBITORS *continued*

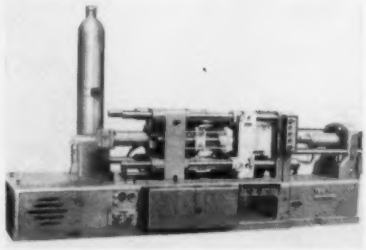
STERLING, INC. 444
. . . is displaying units which accurately control the temperature in dies by circulating fluids at temperatures much higher than those possible with water.

Circle No. 344 on Reader Service Card

FREDERIC B. STEVENS, INC. 413
. . . is showing an automatic plating and processing machine featuring automatic loading and unloading, and selective processing capability. Processing materials are also on display.

Circle No. 345 on Reader Service Card

A. TRIULZI 156



. . . has a display featuring a 150-ton, cold chamber die casting machine with toggle clamping and provisions for automatic operation.

Circle No. 346 on Reader Service Card

UNIVERTICAL CORP. 114
. . . is exhibiting T-Bone nickel anodes which offer many advantages and improvements to the plating industry because of its radical departure from conventional design.

Circle No. 347 on Reader Service Card

VESUVIUS CRUCIBLE CO. 544
. . . is showing their line of crucibles for melting aluminum. These crucibles feature less contamination and easier cleaning.

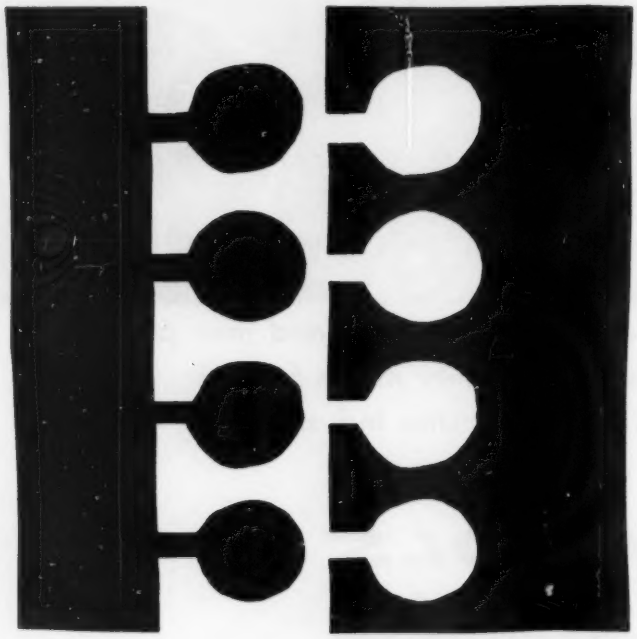
Circle No. 348 on Reader Service Card

WOLVERINE DIE CASTING CORP. 537
. . . is displaying zinc and aluminum die castings with emphasis on various finishing operations, such as automatic machining.

Circle No. 349 on Reader Service Card

The following will also exhibit at the First National Die Casting Exposition & Congress. Booth numbers are listed after the company names.

Alliance Mold Co.	519
Aluminum & Magnesium, Inc.	353
American Charcoal Co.	100
American Rotary Tool Co.	511
Atols Tool & Mold Corp.	205
Buhler Mill Engineering Co.	501
The Carborundum Co.	128
Dodge Steel Co.	301-A
Dow Chemical Co.	117
Elox Corp. of Michigan	300
Encyclopedia Britannica	533
John Erler Industries, Inc.	348
R. H. Freitag Mfg. Co.	332
General Motors Corp.	341
Samuel Greenfield Co.	134
Magnesium Industries, Inc.	132
Martin Mfg. Co.	126
Metal Pumping Service, Inc.	349
Midland Tool & Engineering Co.	252
National Lead Co.	521
Norman Leach Associates	249
Northern Tool & Die Co.	206
Penton Publishing Co.	340
Permanent Mold Die Co.	313
Precision Metal Molding	405
Prospect Die Mold Co.	109
Rebmann Products, Inc.	126
Rex-Buckeye Co.	317
Society of Die Casting Engineers, Inc.	110
Ternstedt Div. of General Motors	153
Udylite Corp.	121
Union Steel Stamp & Die Engravers, Inc.	115
U. S. Dept. of Labor	541
U. S. Reduction Co.	224
Wayne State University	535
Fred C. Ziesenheim, ME	346



super accuracy on complex parts

Need tolerance of 1/100,000″? Machine it!

But for many alloy parts requiring accurate shape, investment casting is the economical answer. We'll make most any shape to your specs—and maintain accuracy throughout.

If you're intrigued, dispatch a sketch of the part to Westinghouse Electric Corporation, Metals Plant, Blairsville, Pa. We'll take it from there. Shell-mold and vacuum casting also available.

J-05014

Westinghouse investment casting minimizes machining yet maintains required tolerances on this unloading comb that must match a mating piece.

You can be sure . . . if it's

Westinghouse

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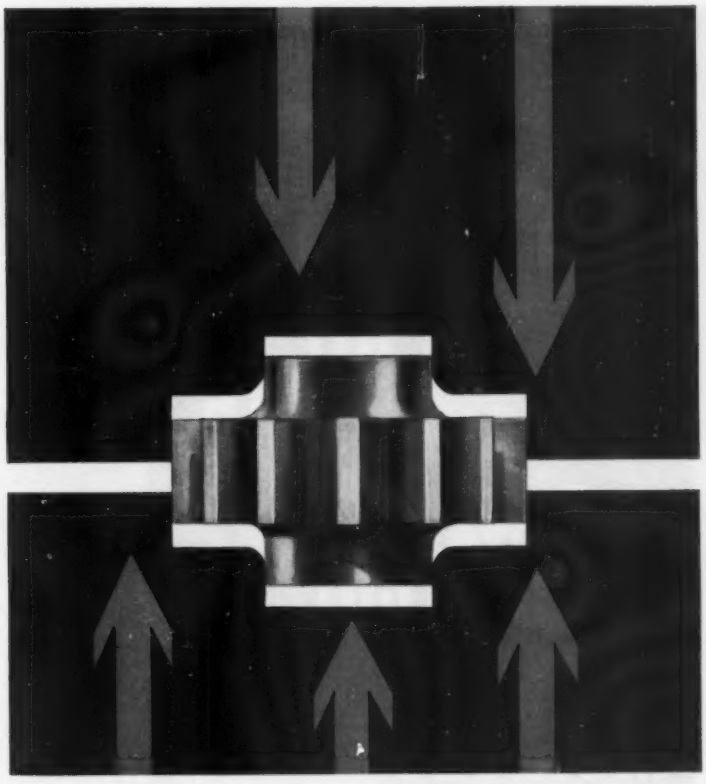


most flexible

powder metal press

available!

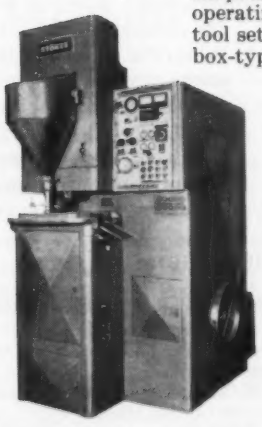
STOKES BUILT-IN PRESS MOTIONS

trim costs of powder metal parts

This 50-ton Stokes press gives you the multiple motions you must have for complex powder metal compacting . . . *without the expense and delay of manufacturing* and setting up complex tooling for *every job.* Stokes built-in motions give highest production of even the most complicated parts.

The Model 640 Powder Metal Press provides two upper and three lower compacting motions with underfill or resistance pressing controls. By simply positioning a selector switch and sequence dials at the control panel, the third lower motion can be set up as a resistance motion, a third lower punch, or as a stationary, movable, or ejecting core rod.

All press motions are precisely indicated and controlled from the central operating position in front of the press. Single cycle control simplifies tool set-up and facilitates compacting of parts with inserts. Rigid cast box-type frame overcomes deflections common in gap frame presses. Yet it provides accessibility for tool changing not available in four post presses.



For complete technical data on Stokes Model 640 50-Ton Multiple-Motion Powder Metal Press, write for Bulletin No. 1200. For any compacting or pressing job, no matter what the material, no matter what the size or production requirements . . . you can do it faster and more economically with Stokes equipment. Consult Stokes Engineering Advisory Service for complete technical assistance in designing parts, punches and dies, or complete production facilities.

STOKES

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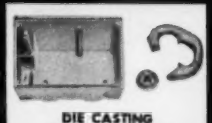
Circle No. 71 on Reader Service Card

1 Casting Process is Best For Your Specific Design...

Hampden Brass Offers 4 Different Methods To Choose From!

PERMANENT MOLD
Aluminum Alloys-High Purity Alloys



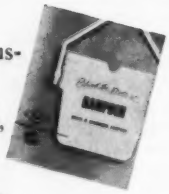
DIE CASTING
Aluminum Alloys-Zinc

SAND FOUNDRY
Aluminum Alloys-High Purity Alloys
Brass-Bronze-Monel

FIBERGLAS CASTING
High Quality Structural Fiberglas
Modern Vacuum Process

ONLY ONE IS BEST!
Let Hampden Brass's experts help you decide which process best suits your requirements . . . and help you produce a better product at lower cost!

Like to know more about Hampden Brass? Write for Illustrated Brochure, "Behind the Scenes" . . . a complete Digest of Hampden Brass's experience, equipment and facilities.



HB

For Guaranteed Quality . . .
Look to the Diamond of the Industry

Hampden Brass & Aluminum Company
Established 1903
SPRINGFIELD, MASSACHUSETTS

Complete Pattern, Machine, and Die Shops . . .
X-Ray and Laboratory . . . Heat Treat and Wheelabrator facilities

Circle No. 32 on Reader Service Card

COMPOSITE POWDERS *(continued)*

ever, in composite C1 compacts, only the nickel is continuous. The thermal coefficient of expansion of copper is greater than that of nickel, and the volume expansion of copper on melting is about 5%. In the case of mixed powder compacts the copper is free to expand. Above the melting point of copper, particles or agglomerates of nickel are effectively swimming in a sea of liquid. Since liquid copper wets nickel, relatively large pores develop in the liquid. The size of these pores is determined by the size of the solid nickel particles or agglomerates. In the case of composite powder compacts, on the other hand, expansion of copper on heating and melting is constrained by the surrounding nickel. Pressures are therefore built up within the compact which might be expected to accelerate the rate of diffusion. Furthermore, the formation of large voids in the liquid phase should not occur in this case. Figures 9, 10, 12, and 13 may thus be interpreted qualitatively not only on the grounds of the degree, but also on the nature of dispersion of the components in composite and mixed powder compacts. Actually, the conditions prevailing in these compacts at 1900° and 2200°F are more complex than indicated above, but a more rigorous treatment is not possible on the basis of the data available at present.

CONCLUSIONS

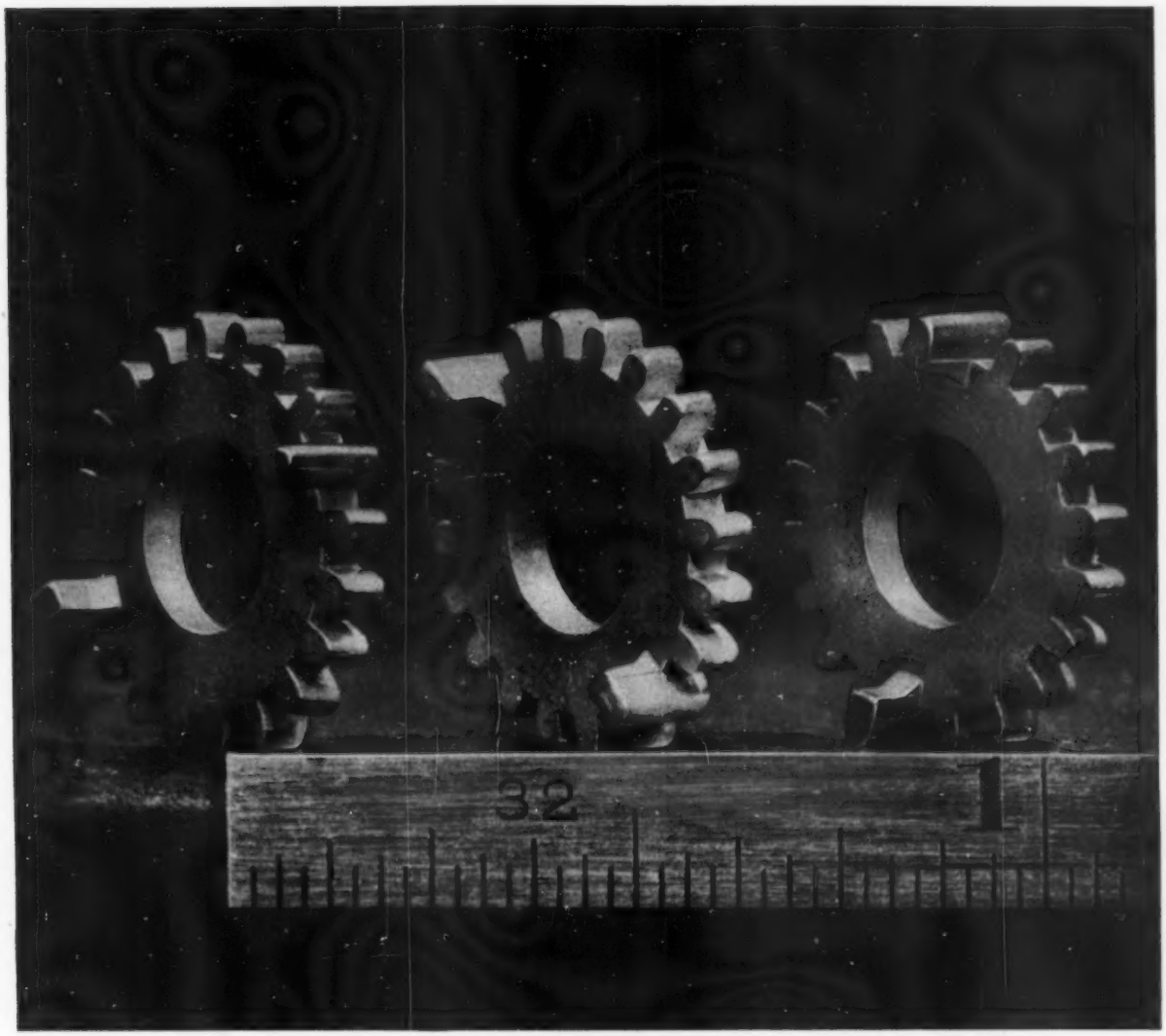
Advantages of composite nickel-coated powders over mixtures of similar composition have been identified on the basis of experimental work:

- A high degree of mechanical dispersion of nickel and another component is inherent in the composite powders.
- The dispersion of the components does not deteriorate during storage processing of composite powders.
- A nickel coating on a reactive core particle will reduce oxidation or other reaction of the core particle with gaseous or other non-metallic elements at elevated temperatures. This will limit the formation of diffusion inhibiting films and facilitate alloying between the components.
- A maximum contact area between the components in a compact is inherent in the use of composite powders provided the core particles are completely coated.
- When the core substance of a nickel-coated composite powder has a melting point lower than that of nickel, liquid-phase sintering of compacts is possible without large-scale expansion of the compacts, and alloying between the components is probably accelerated by the development of pressures within the compacts.

THE AUTHORS

J. A. Lund is assistant professor of metallurgy, University of British Columbia, Vancouver, Canada.
T. Krantz is a research engineer for the research and development division, Sherritt Gordon Mines, Ltd., Fort Saskatchewan, Canada.
V. N. Mackiw is director of research and development division, Sherritt Gordon Mines, Ltd.

This paper was presented at the annual meeting of the Metal Powder Industries Federation, April, 1960.



Baldwin press pins back ears of difficult powder metal part

The two tiny ears (lugs), continuation of the teeth on opposite sides of these tiny gears, make this a really difficult compacting job. Not only are the tolerances extremely tight for such a small part (plate thickness ±0.0015, center hole diameter ±0.001, total composite error only ±0.0015 in.), but the lugs must support a static load of 60 lb. during operation. Yet a Baldwin Press at the Supermet Division of Globe Industries, Inc., Dayton, Ohio, is turning out millions of these complicated adding machine parts at high speed.

Because of the extremely fine punches required for the lug compaction, a special protective accessory was designed to minimize punch breakage. Baldwin's patented dual-ejection mechanism made possible part expulsion without damaging the lugs.

Expanded facilities at our Industrial Equipment Division assure early delivery and continued high standards of manufacture in compacting presses that can do the job fast and economically. Write for information and specifications.

BALDWIN · LIMA · HAMILTON

Industrial Equipment Division · Philadelphia 42, Pa.

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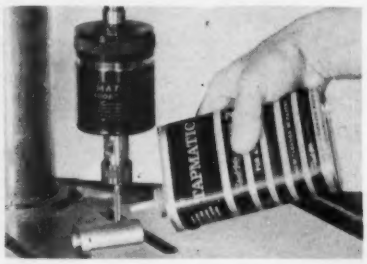
NEW PRODUCTS *(cont.)*

CUTTING FLUIDS



TAPMATIC CORP.—Originally compounded for better tapping results, the Dual-Action cutting fluids are equally effective on reaming, parting, threading, and other precision machining operations. The fluids combine chilling and lubricating in a controlled time cycle.

Circle No. 245 on Reader Service Card

VACUUM GAGE

GENERAL ELECTRIC—A self-contained rechargeable battery power supply is featured on a new portable thermocouple vacuum gage. The instrument can be operated for up to 60 hours on its battery, or it can be plugged into any 120-volt AC outlet. When plugged in, the battery is recharged.

Circle No. 246 on Reader Service Card

COMPACTING PRESS

HALLER INC.—This crank toggle 40-ton briquetting press has a hydraulically controlled floating die table to insure uniform density of the compact. A hydraulic pressure control sets the exact tonnage used on each press stroke.

A shaking motion in the fill shoe aids the powder flow. Press design permits easy tooling set-up.

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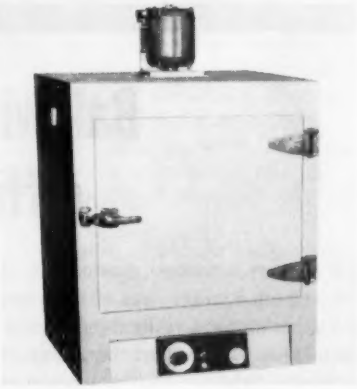
LABORATORY OVEN



DESPATCH OVEN CO.—The model VU-5-33 laboratory oven provides automatic control over a three heat range up to 500°F. and costs $330. The compact oven has a forced convection system which provides exceptionally good air uniformity. The unit is shipped completely wired and ready for operation.

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FOR COMPLETE DIE CASTING SERVICE

After 30 years of serving the die casting industry we have expanded to offer you complete die casting service.

DESIGN —
Our staff of experienced die casting engineers stay with the job from initial design to finished casting.

DIE CASTING —
Complete facilities to produce castings weighing 14 lbs. zinc.

PLATING —
Plating of all sizes, weights, and types available, from barrel zinc to the most difficult, automobile bumpers.

LABORATORY & INSPECTION FACILITIES —
Our laboratory and inspection facilities is your assurance of quality castings.

Sales Representative —
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14301 West McNichols Rd.
Detroit 35, Michigan
Telephone:
Broadway 3-6283

DiSalle

The DiSalle Plating & Die Casting Co., Inc.
2851 South Ave.
Toledo 9, Ohio

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Circle No. 51 on Reader Service Card

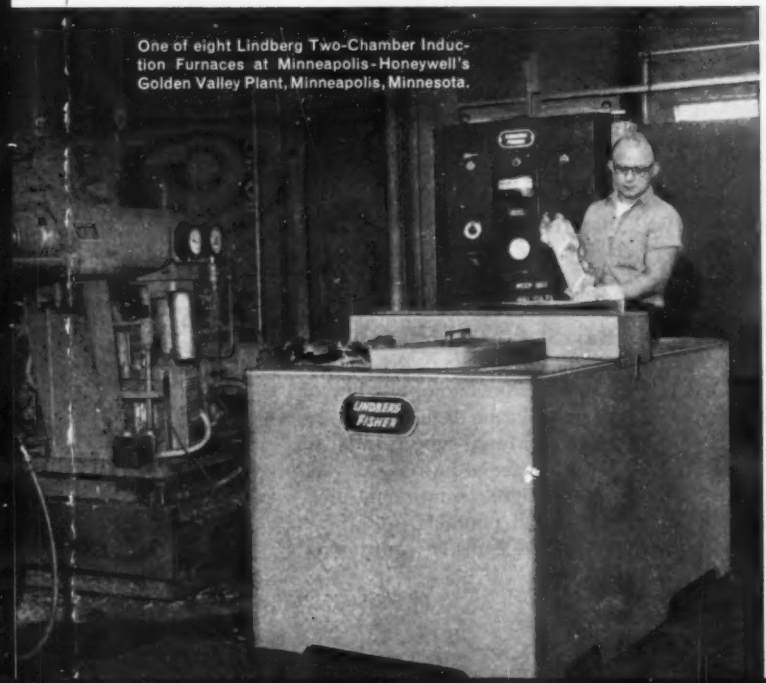
ART GEORGE has a good word to say for Lindberg Melting Furnace performance

QUOTE

Mr. Art George, Senior Production Engineer, Golden Valley Plant, Minneapolis-Honeywell Regulator Company, Minneapolis, Minn.

"Our installation of eight* Lindberg-Fisher Two-Chamber Induction Melting and Holding Furnaces has given remarkable service for more than four years. In this period, with the help of a well executed Honeywell maintenance program, the installation has been unusually trouble-free. Only one of the eight furnaces has required relining over this long period. Handling more than 1,000,000 pounds of aluminum and zinc annually, the installation has unfailingly provided the consistently high quality of metal our precision instruments require."

**Altogether, 44 Lindberg Furnaces are in operation in various Honeywell plants.*



One of eight Lindberg Two-Chamber Induction Furnaces at Minneapolis-Honeywell's Golden Valley Plant, Minneapolis, Minnesota.

These eight Lindberg-Fisher Induction Furnaces melt and hold aluminum and zinc for die casting gas valve housings and other component parts. They are located at the die casting machines where ingot and scrap can be melted and held at the desired casting temperature in one convenient unit. Magnetic fluxing and stirring insures uniform temperatures and consistently clean metal.

In any production process where aluminum needs heat there is Lindberg equipment to apply it most economically and efficiently. Furnaces for melting and holding, casting stations, re-melting or heat treating are available in all capacities, electric or fuel fired. Get in touch with your Lindberg Field Engineer (see your classified phone book) or write us direct. Lindberg-Fisher Division, Lindberg Engineering Company, 2463 West Hubbard St., Chicago 12, Illinois.

Los Angeles plant: 11937 S. Regentview Avenue, Downey, California. In Canada: Birlefco-Lindberg Ltd., 15 Pelham Ave., Toronto 9, Ont. Also, Lindberg plants in Argentina, Australia, England, France, Italy, Japan, South Africa, Spain, Switzerland and West Germany.

LINDBERG
heat for industry

USEFUL LITERATURE, CATALOGS, MANUALS

Qualified readers may obtain any of these technical publications by circling the numbers on the Reader Service Cards facing Page 82

PROCESSES

165 **Extrusions**—GENERAL EXTRUSIONS INC.—40-page catalog lists 700 stock dies for aluminum extruded shapes, rods, and bars.

166 **Castings & Extrusions**—DOW METAL PRODUCTS CO. —10-page brochure describes facilities for casting and extruding.

167 **Investment Castings**—LEBANON STEEL FOUNDRY— Technical bulletin discusses specifications, costs, and facilities requirements for the X-ray inspection of steel investment castings.

168 **Investment Castings**—SHAW PROCESS DEVELOPMENT CORP.—56-page booklet describes the Shaw Process for making large, high-strength, close tolerance castings.

169 **Sinterings**—AMERICAN POWDERED METALS, INC.—8-page technical booklet on the efficient and economical design of sinterings.

170 **Extrusions**—GENERAL EXTRUSIONS, INC.—12-page technical booklet lists mechanical properties and standard tolerances for extrusions, includes alloy selection data.

171 **Castings**—BENDIX FOUNDRIES—23-page technical booklet tells why they can recommend the most economical casting process to meet your requirements, includes design and finishing data.

MATERIALS & EQUIPMENT

176 **Cobalt Alloys**—COBALT INFORMATION CENTER—4-page brochure lists the engineering properties and applications for 13 cobalt alloys.

177 **Die Casting Accessories**—ADVANCE PRODUCTS CORP.—Data sheet describes shot sleeves, bushings, and plunger tips.

178 **Die Casting Dies**—BENERSON CORP.—Brochure describes their facilities for making dies and tools.

179 **Die Casting Dies**—COLUMBIA ENGINEERING CO., INC.—26-page catalog gives prices and design specifications for standard and special die casting die bases.

180 **Vacuum Gages**—CONSOLIDATED VACUUM CORP.— 32-page technical booklet lists performance data and specifications on a line of vacuum gages.

181 **Tool Control** — REMINGTON RAND DIV. — Data on a clerical system for keeping track of your tool crib inventory.

182 **Plant Maintenance**—JOHNSON'S WAX CO.—Manual tells how to maintain the interiors of industrial buildings.

183 **Overload Detector**—WINTRISS, INC.—4-page bulletin shows how a low-cost unit provides instant visual indications of press malfunctions.

184 **Lubricants** — DOW CHEMICAL CO. — Literature on the Ambiflo line of multi-purpose, synthetic fluids for the metal working industry.

185 **Refractory Metals** — FANSTEEL METALLURGICAL CORP. — External house organ discusses the applications for tungsten, molybdenum, tantalum and columbium.

186 **Electrical Controls**—R. B. DENISON MFG. CO.—4-page catalog digest describes their line of Loxswitch Heavy Duty and Precision Limit Switches for machine tools.

187 **Pulse Switch** — MINNEAPOLIS HONEYWELL REGULATOR CO. — 2-page data sheet describes an adjustable industrial pulse switch for applications in which momentary opening and closing of a circuit is necessary.

188 **Combustion Equipment** — BRYANT INDUSTRIAL PRODUCTS CORP. — 8-page catalog includes technical data on gas combustion and control equipment.

189 **Flexible Shafts**—S. S. WHITE INDUSTRIAL DIV.—88-page handbook tells the designer how to select stock or custom designed flexible shafts.

190 **Thermocouples** — CONAX CORP. — 32-page catalog describes a complete line of thermocouple fittings, pressure sealing glands and other thermocouple accessories.

191 **Electrical Control** — MINNEAPOLIS HONEYWELL REGULATOR CO. — 4-page technical bulletin describes a unit for the time-proportioning control of on-off control elements.

192 **Oil Filters**—ALSOP ENGINEERING CORP.—Data sheet describes a new line of portable, hydraulic oil filters for hydraulic systems.

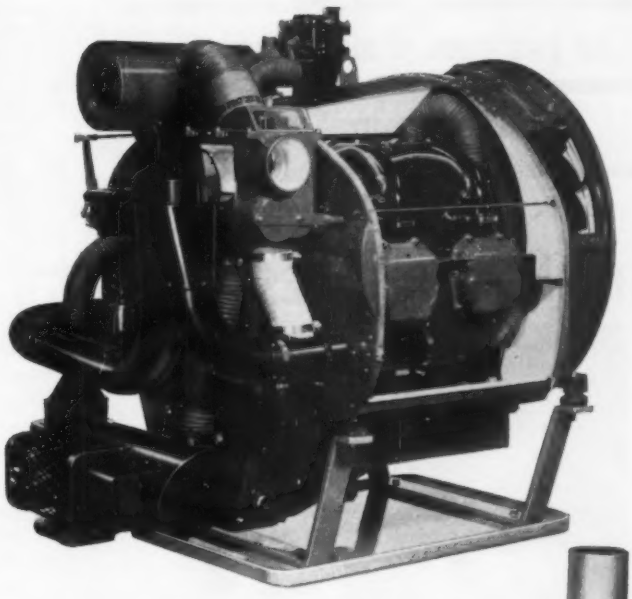
FINISHING

201 **Barrel Plating**—HANSON-VAN WINKLE-MUNNING CO.—Bulletins describe a complete line of barrel plating equipment, including Mercil-type portable barrels, special barrels, Mercil-type hanger equipment, plating barrel contacts, and tank drive and transfer equipment.

FLANGES
cast by Misco
MONO-SHELL

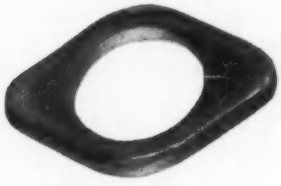
for
Exhaust Manifolds
of
PE90-2 PACKETT ENGINE

Save TIME!
Reduce COSTS!
Improve PERFORMANCE!



Misco recently helped a major sub-contractor of Continental Motors Corporation solve the problem of producing flanges for the exhaust manifolds of Continental's PE90-2 Packett Engine. Over 65,000 Misco flanges have been produced for 15 engines produced by Continental Motors.

SAE 1010 stampings were found unsatisfactory, and AISI 347 stainless steel flanges for improved performance could not be economically fabricated by stamping or shell mold casting. AISI 347 flanges were then cast by Misco MONO-SHELL improving quality and reducing costs.

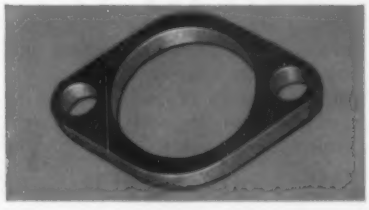


STAMPING

Part required machining to correct warpage. Three holes required machining. Edges required finishing. Stamping die wear was excessive and die costs high. Four men and machines were required for machining. A large stamping inventory was needed to meet production needs. Part quality was inconsistent causing rework at assembly.

SHELL MOLD CASTING

Three holes required machining. Flange thickness and edges required finishing. Machining costs not reduced. Inventory reduction was the only advantage over stamping.



MONO-SHELL CASTING

Holes are cast to size. Flanges are ready for assembly as delivered, reducing inventory. Tooling costs were less than half of that required by other two methods. The MONO-SHELL flanges incorporate all of these advantages at a 15 per cent reduction in total flange cost.

Send us your inquiries, details of your requirements, or parts for quotation.

Misco Precision Casting Company

Plants in
WHITEHALL, MICHIGAN
MUSKEGON, MICHIGAN

MISCO

Address inquiries to
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MONO-SHELL

Sales Offices in Principal Cities

PRODUCERS OF AIRCRAFT AND INDUSTRIAL INVESTMENT CASTINGS

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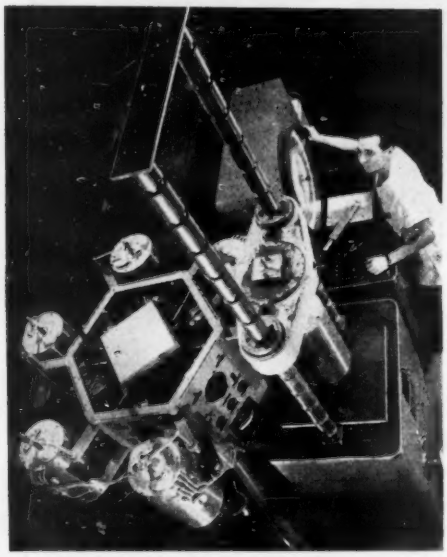
So you need a metallurgist...

what's your problem?

ELEVATED TEMPERATURE TESTING?



Elevated, reduced and room temperature testing of all mechanical properties is one of our specialties.

Without obligation, send for our brochure and price lists covering complete metal testing and research services. If your problem involves chemical composition, physical-mechanical properties or metallurgical requirements.

Call: LUdlow 8-4161

METAL CONTROL LABORATORIES

INCORPORATED

MCL

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HUNTINGTON PARK, CALIF.

The Leading Metallurgical Laboratories on the Pacific Coast

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USEFUL LITERATURE *(continued)*

Marking & Numbering Machines—THE ACROMARK CO.—130-page catalog and price list describes over 500 marking and numbering devices. Offered to executives making request on company letterhead, 426 Morrell St., Elizabeth 4, N.J.

203 **Abrasive Blast Cutting**—S. S. WHITE INDUSTRIAL DIV.—15-page bulletin describes an abrasive blast unit for cutting or cleaning hard, brittle materials, includes technical application data.

204 **Vibratory Finishing Machines**—SYNTRON CO.—4-page brochure describes a line of vibratory barrel finishing machines, includes specifications.

205 **Barrel Finishing Media**—TUMB-L-MATIC, INC.—4-page brochure describes a complete line of barrel finishing compounds, abrasives, soaps and general media.

206 **Batch Cleaning**—MAGNUS CHEMICAL CO., INC.—12-page booklet on industrial batch cleaning discusses the efficiency and effectiveness of different methods.

207 **pH Meter**—SEL-REX INSTRUMENTS, INC.—Data sheet shows how precise, reproducible readings are obtained with a palm-sized pH meter requiring standardization only once a week or less.

208 **Zinc Finishing**—LEA MFG. CO.—Data sheet on polishing wheel speeds, type of buff and recommended abrasive compounds for the abrasive finishing of die cast zinc.

209 **Vibratory Finishing**—LORD CHEMICAL CORP.—12-page booklet shows the operating principle and a line of equipment for deburring and finishing by the vibratory method.

210 **Heat Treating Equipment**—SELAS CORP. OF AMERICA—16 page bulletin describes machines for heat-treating, selective hardening, brazing, soldering, annealing and other metal heating processes.

211 **Chemical Finishing**—ENTHONE, INC.—8-page brochure describes equipment for plating, blackening, cleaning, pickling, chemical processing, waste disposal, and corrosion controls.

212 **Drilling Unit**—UNIVERSAL-AUTOMATIC CORP.—Catalog describes a high speed, single spindle automatic unit for drilling, tapping, threading, nut tapping, reaming and other basic secondary operations.

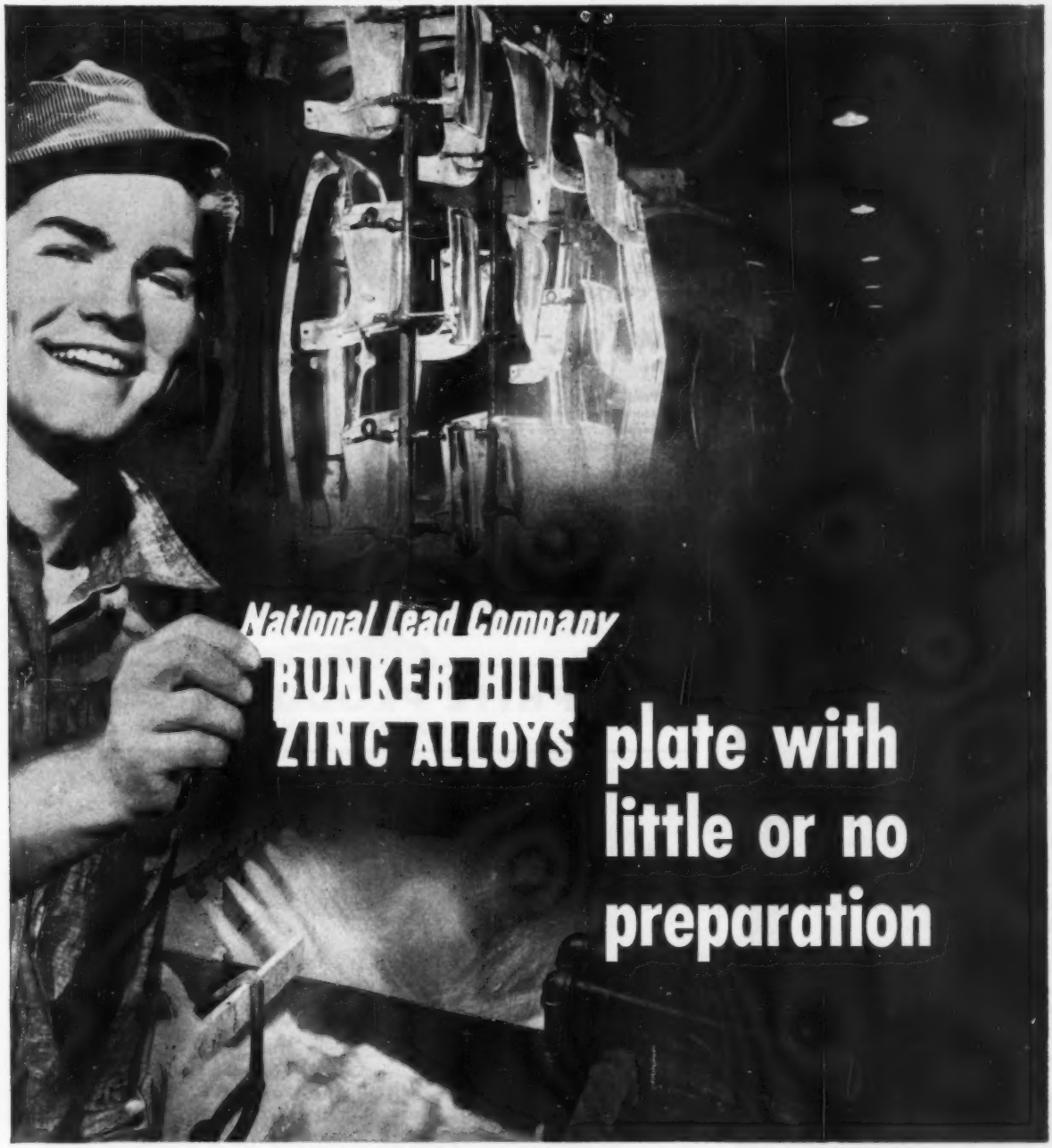
213 **Turret Drill**—BURGMASTER CORP.—literature on a 6-spindle turret drill that speeds precision drilling operations and reduces tooling costs by eliminating box fixtures and jigs.

214 **Tap Holder**—R AND L TOOLS—Data on a unit which serves as a tap holder, an acorn die holder, or a button die holder for right and left hand threading and tapping.

215 **Trimming Presses**—KENCO MANUFACTURING CO.—Technical data on a line of variable speed presses for full press tonnage over the whole range.

216 **Code Marking**—THE ACROMARK COMPANY—Details on a bench model unit for code marking ports rapidly.

217 **Nickel Stripper**—ENTHONE, INC.—Literature on a ready-to-use stripper for nickel and other metals.



The as-cast finish you get from ***National Lead*** Bunker Hill Zinc Alloys is ready for plating. Any preparation—if required—is small and simple.

The basic reason is simple, too: extreme purity. ***National Lead*** Bunker Hill Zinc Alloys exceed ASTM and SAE specifications for freedom from contaminants. You get sound, high-strength castings—unmarred by porosity—that require very little machining. They fabricate neatly and economically ... whether trimmed, punched, tapped or broached ... help you maintain fast, economical production on all machines.

Get full value—from forming to finishing—by starting with ***National Lead Company*** Bunker Hill Zinc Alloys... respected everywhere for their ability to speed production, minimize rejects. When you need them, simply call us.

National Lead Company

[redacted]

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Offices in principal cities

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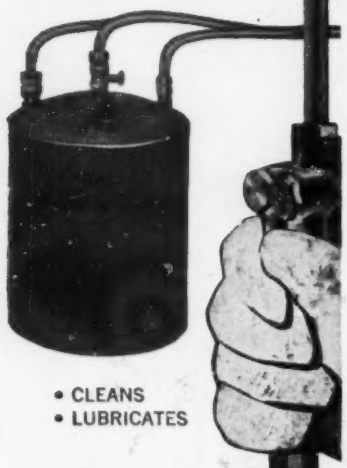
Circle No. 108 on Reader Service Card

THE PIERCE-WALLER

AIR-LUBE

SYSTEM

CUTS COSTS for DIE-CASTERS



• CLEANS
• LUBRICATES

Remove loose flash and clean the mold with a powerful, clean air blast — then lubricate all mold surfaces evenly, *using the same gun* —with a flick of the thumb! Adjustment *at the gun* for full range from zero to a heavy mist, spraying, fogging, or vaporizing the lubricant. Speeds up mold operation and reduces casting rejects. Makes every machine cycle count.

USED IN LARGE AND SMALL SHOPS EVERYWHERE!

WRITE FOR FREE FOLDER

PIERCE-WALLER, INC.

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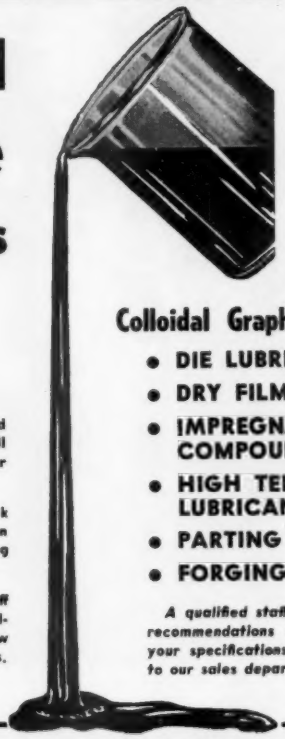
Colloidal Graphite dispersions

can help you

3 WAYS:

1. **Production** — For established production processes we will prepare dispersions to meet your specifications.
2. **Development** — We will work directly with your engineers on development projects requiring specialized dispersions.
3. **Research** — Our research staff is always available for consultation on new products, new processes and new applications.



Here are a few uses of

Colloidal Graphite Dispersions:

- DIE LUBRICANT
- DRY FILM LUBRICANT
- IMPREGNATING COMPOUND
- HIGH TEMPERATURE LUBRICANT
- PARTING COMPOUND
- FORGING COMPOUND

A qualified staff is available for prompt recommendations and quotations to meet your specifications or preliminary inquiries to our sales department.

GRAPHITE PRODUCTS CORP.
BROOKFIELD, OHIO

KOZMA

Invites you to

SEE IT NOW!

New AUTOMATIC LADLING UNIT

At the First National Die Casting Exposition and Congress
Booth No. 448, November 8-11
Detroit Artillery Armory, Detroit, Michigan

THE NEWEST AND FINEST DEVELOPMENT FOR DIE CASTERS IN A DECADE!

Our new Automatic Ladling Unit offers you all these features:

SPEED . . . ACCURACY . . . LOW COST
METAL PURITY . . . SAFETY . . . EFFICIENCY
MINIMUM MAINTENANCE

and, in addition, the Kozma Automatic Ladling Unit can be adapted to fit almost all furnaces and machines.

We cordially invite you to visit our booth at the First National Die Casting Exposition and Congress where we will show you this new development and our well-known line of melting and holding furnaces.

INDUSTRIAL PROCESSING FURNACES • SINCE 1928

J. A. KOZMA Company
3471 WYOMING
DEARBORN, MICHIGAN

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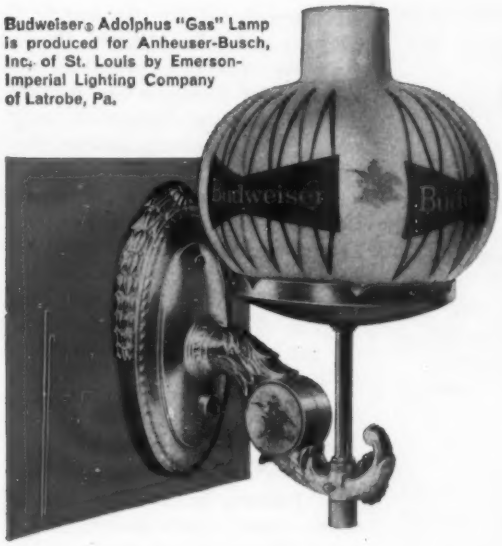
Budweiser® Adolphus "Gas" Lamp is produced for Anheuser-Busch, Inc. of St. Louis by Emerson-Imperial Lighting Company of Latrobe, Pa.



L. D. C. ZINC ALLOY DIE CASTINGS

add a bright new light to an effective sales technique

Here's point-of-sale advertising at its best—commandeering attention and holding its enviable and permanent position in the center of a highly competitive consumer market—creating impulses that roll into steady sales—continuously!

Yes, Budweiser® Adolphus "Gas" Lamps by Anheuser-Busch, Inc., do just that—doubly so, because they're installed in pairs, flanking the ends of thousands of backbars across the country.

So you order a "Bud"®, and your eyes dance over the quaint old-fashioned design of the Lamp's base, as you wait to be served. How sharp the minute details of the design in the base appear—and are! The smooth, even fit of the parts . . . the soft, golden finish that glistens so bright . . .

Now you know! That elegant, ornate base is L. D. C. Zinc Alloy Die Casting! It has captured and preserved all the warmth and friendliness of a Century passed through modern design techniques and color treatment that only quality workmanship through quality materials can produce.

L. D. C. Zinc Alloy Die Castings electroplate easily and retain a high gloss polished finish.

Dimensional stability and strength of L. D. C. Zinc Alloy Die Cast shells assure neat, accurate fit, and a smooth, even finish that sharpens design details.

Latrobe Die Casting Co.
LATROBE, PENNSYLVANIA

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505 Wadsworth St.
Tel: Chestnut Hill 7-8833

Established 1918

Circle No. 48 on Reader Service Card

INDUSTRY NEWS (*continued*)

NAME CHANGE

The American Brass Company will officially change its name to Anaconda American Brass Company it was announced by company president, Richard M. Stewart.

"There has been a trend in our business toward advertising, marketing and packaging our goods under the brand name 'Anaconda,' and it is only common sense that we identify our brand name with our company name," he added.

Stewart said that the name change will not affect the company's operating policies.

REPRESENTS ISRAELI DIE CASTERS

Die casting plants in Israel offering complete machining, polishing, and plating facilities are now represented in the United States by Solcoor, Inc. of New York City. Solcoor announced that buyers here seem to show the most interest in importing brass castings, although the Israeli group also offer aluminum and zinc casting facilities.

NEW SALES REPS

A new sales organization, Salescraft Associates, has been formed in Cleveland by Richard W. Devans and John Mihovk. Devans formerly was vice president and treasurer of Precision Metalsmiths, Inc. Mihovk was director of design and tool engineering at the same company.

Salescraft currently represents Cadmet Corp., Precision Forgings, Inc., Denison Pattern Works, and D.G. & S. Machine & Tool Co., Inc. The firm is interested in acquiring lines in the permanent mold and die casting and powder metallurgy field.

A. JOHNSON & COMPANY OPENS NEW LAB

A. Johnson & Co., Inc. has recently opened a new powder metallurgy laboratory and service center in Newark, N.J. The laboratory is now investigating the factors contributing toward high density ferrous powder metallurgy.

The service center has screening and blending equipment, including a 7½-ton double cone blender.

NEW FURNACES AT H. M. HARPER CO.

The H. M. Harper Company has announced the acquisition of two new heat treating furnaces which will permit them to heat treat much longer extruded shapes and rods, as well as increase their capacity of annealing coiled wire.

ENTHONE APPOINTS FRENCH LICENSEE

Enthone, Inc. subsidiary of American Smelting and Refining Company, has announced the licensing of Pernix Grauer & Weil of Paris to manufacture, sell, and service Enthone products in France, Belgium, Spain, Portugal, and French Overseas Territories.

OLIN NAMES DISTRIBUTOR

Bay State Aluminum Company, Inc. has been appointed a distributor for Olin Aluminum casting alloys. For 25 years Bay State was engaged in the industrial scrap iron and metals salvage business. It became an aluminum smelter and supplier of secondary aluminum ingots in 1948 with the establishment of its Middleboro smelting plant.

more industry news on page 104

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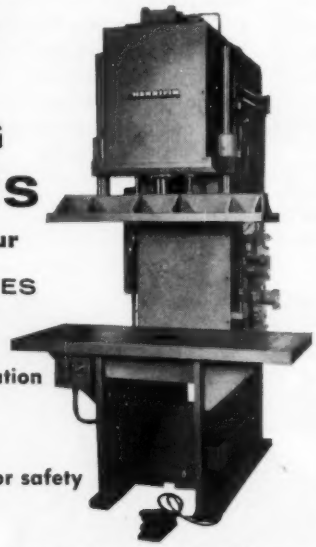

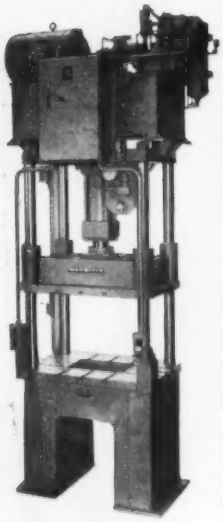

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PNEUMATIC AND HYDRAULIC SYSTEM COMPONENTS

Circle No. 60 on Reader Service Card

CHANGE-OVER

continued from page 40

Lammers explained.

Fuller's earth bypass filters are added to each converted machine, to guard the fire-resistant fluid from possible contamination.

"These bypass filters get out most of the gunk," Lammers said. "But, after all the machines are converted, we'll start using a mobile fuller's earth filter to get all of it. The filter is hooked to the tank of each machine for about four hours every three weeks, and doesn't interfere with its operation."

This is similar to the manner in which water is removed. A mobile centrifuge is used on each machine for about two hours, once a month, without interrupting operation.

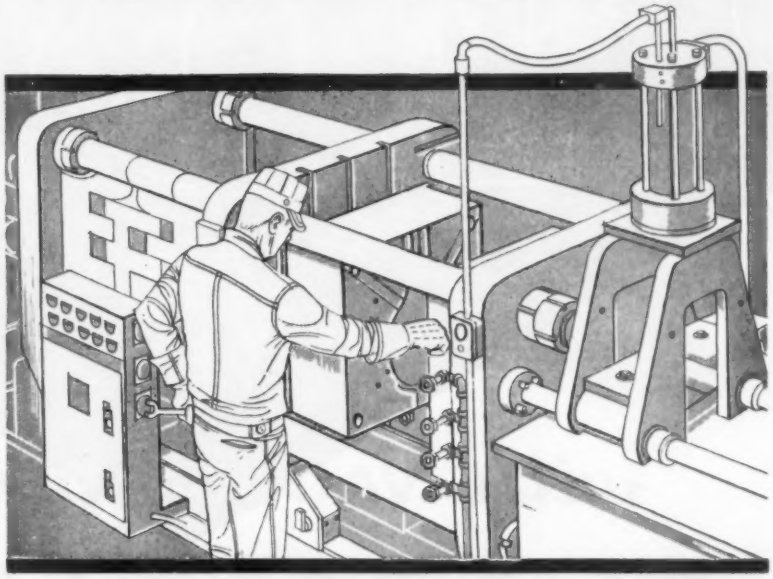
Ross heat exchangers on the machines keep the fluid at the proper 110 degrees operating temperature.

The solvent action, important for clean-running systems, also makes it handy as a reclaimable flushing fluid. When a converted machine is ready to go back in service, it is flushed out with the fluid from two drums especially set aside for this repeated use. The system's filter is then cleaned, fresh fluid installed, and the machine is ready for use.

"We have coupled these conversion methods with an improved maintenance program to further cut fluid losses," Lammers said. "For example, if a leak occurs, a bucket is never placed under it and operation continued. The machine is shut down and the leak repaired immediately.

"On the basis of the first six machines we converted, we believe our changeover will be entirely successful," Weinmann declared. "We are glad of it, not only because of the much longer pump life we can expect, but also because we believe that synthetic fluids are the safest of all fire-resistant types. There's no water in them to produce steam and create a burn hazard if the fluid strikes a hot surface."

If you can do it with light alloys . . . you can do it BETTER with PMD dies!



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When you specify Thermold AV, you specify the ultimate in melting techniques, plus quality controls which have set the standard for the industry—small batch furnace melting, close control of press forging and annealing, and 100% Reflectoscope testing.

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Circle No. 111 on Reader Service Card

Designing FOR MULTIPLE PRODUCTS IN SINGLE TOOLING WITH MADISON-KIPP

ZINC AND ALUMINUM DIE CASTINGS

The three castings illustrated are made in the same die. Provision for the changeable die parts must be included in the original die design. Expert die making is also involved, but the end results of this type of pre-planning represent substantial savings in many instances.

Madison-Kipp is skilled and seasoned in die casting mechanics and invites your inquiries for cooperative effort.

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Circle No. 52 on Reader Service Card

MEASURING THE DRYNESS OF DIPCOATINGS

By JOHN HOCKIN, *Castings Engineers, Chicago, Ill.*

WRONG RESULTS are often gotten when the dryness of refractory shells is estimated. Changes in humidity and temperature can have a large effect and well exposed surfaces will dry much faster than pockets and cored holes.

Cobalt chloride changes color with changes in water content. The hydrated salt is pink and the dehydrated salt blue. With a relative humidity of 40% or less and a temperature above 75°F. the change in color can be used to indicate dryness of a dip coat.

When hydrated cobaltous chloride ($CoCl_2.6H_2O$) is dissolved in an organic solvent such as acetone or ethanol, the blue dehydrated salt is formed and the solution is blue.

If a drop of this blue, dehydrated, solution is put onto a dipcoat the time required for the blue color to disappear is a function of the moisture content of the dipcoat. This assumes that the humidity and temperature of the test area are correct.

Tests were made to determine if this method could be used as a production tool. A solution of hydrated cobaltous chloride containing 19 grams of salt per 100cc of solution was made. The length of time required for the color to fade when the dipcoat was dried, in circulating air at 70° to 75°F and from 40% to 50% relative humidity, was measured. The results are given in Table I.

The method of judging when no blue color remains is a matter of judgment and practice. For these tests the time for the last blue to fade rather than for the pink color to appear was taken. Also the size of the drop of solution will vary the time required so that this size must be standard.

TABLE I
RESULTS OF SPOT CHECKS ON DIPCOATS

Drying Time in Hours	% Water Removed	Seconds for Blue to Fade	
		Acetone Solution	Ethanol Solution
0.0	0	15	30
0.5	60	30	43
1.0	85	50	70
1.5	94	60	105
2.0	98	70	150
2.5	99	80	175
3.0	100	90	200

Once a routine has been established for the drying conditions in any plant this spot test can be used with only occasional checks for accuracy of observations.

Generally several spots on a cluster should be checked and the spot requiring the shortest time for the blue color to disappear taken as the test point. This is the slowest drying area.

Periodic checks must be made on temperature, humidity, and circulation in the drying area if this test is to be reliable.

Editor's note: This report is a condensation of an Intra-Industry Research Program report. The research was carried out under the auspices of the Investment Casting Institute. Some of the work was done at Bristol Siddeley Engines, Ltd. in England.

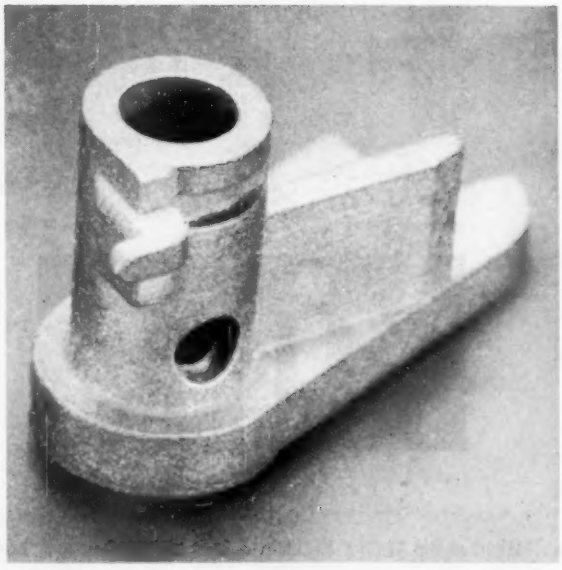
INVESTMENT CASTING USED IN COIN CHANGER

ONE 303 STAINLESS STEEL investment casting has replaced a series of stampings and screw machine parts which were formerly brazed together.

The result is a stronger, more rigid part at a very considerable cost reduction.

The part is used on a coin changing machine and is fabricated by Casting Engineers, Inc. But changing to an investment casting did more than cut costs and strengthen the part. A far better contour is now possible, strengthening ribs can be put exactly where they are needed at no increase in cost.

An added feature is the superior surface finish on the casting. The roughest surface is only 45 micro-inches.



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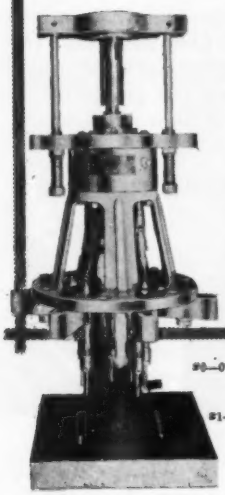
ERRINGTON

UNIVERSAL JOINT ADJUSTABLE TAPPING & DRILLING HEAD



Here's another hi-speed production tool from Errington. This dependable tool is adjustable to any pattern of holes . . . is available with 4 or 6 spindles. Positive clutch drive and reverse. Head made of the best grade sand Cast Aluminum with hardened and ground gears and spindles (made in one piece). Full grooved ball thrust bearings at all thrust points and Oilite bronze radial bearings. *Remember to do more . . . better . . . faster . . .* rely on Errington Hi-Speed Production Tools.

#0—0" to ¼" Tap Capacity
Min. centers 11/16"
Max. Pattern 5¾"

#1—7/32" to ½" Tap Capacity
Min. centers 1¼"
Max. Pattern 8"

LESS THAN ½ MINUTE TO CHANGE HEAD FROM DRILLING TO TAPPING OR TAPPING TO DRILLING

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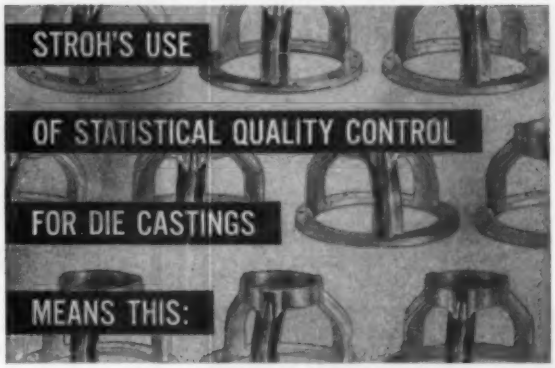

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3. UNIFORM HIGH QUALITY: This new concept of quality control for die castings means that buyers of die castings who rely on statistical dimensioning are assured of accurate parts ready for assembly.

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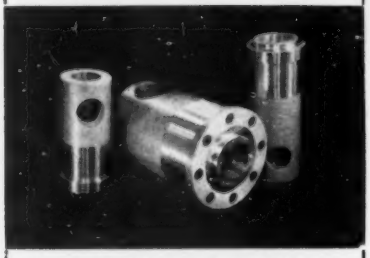

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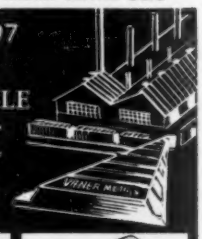

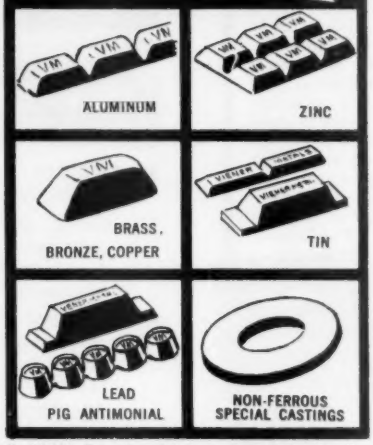

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INDUSTRY NEWS*(continued)*

BUILDS NEW PLANT

Atols Tool and Mold Corp. has moved to a new plant in Schiller Park, just outside Chicago. The new plant doubles their previous floor space. John M. Atols, president of Atols, said that production by their 100 employees was not disrupted during the move.

H-VW-M PROMOTIONS

CARLSON

NORTOF

Hanson-Van Winkle-Munning Company has announced the promotions of Everett E. Carlson and Albert A. Nortof to the positions of chief chemist and process electrochemist respectively.

In his new position Carlson will be responsible for all functions of

Among Things We Know About

THERMOLATOR®

DIE TEMPERATURE CONTROL

Almost unbelievable results are being reported . . .

- New Tops in Maximum Production
- Superior Surface Finish; Tensile Strength; Dimensional Uniformity
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For Die Casting and Permanent Molding

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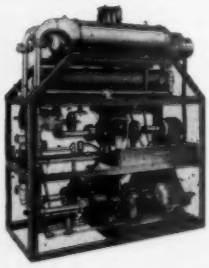

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is the first prerequisite for quality die castings. Our staff of expert designers, engineers and production men have the know how and experience of over 31 years in the industry to save you money while turning out top quality castings.

GUARANTEED QUALITY —

As a licensed producer of die castings under the Certified Zinc Alloy Plan, you can be sure that your zinc castings conform to the strict chemical composition limits for maximum mechanical and physical properties.

PROGRESS —

Our participation in the Die Casting Research Foundation is our way of contributing to the future development of the die casting process and its usefulness as a metal working method.

For quality, service and economy, the above symbols are your guide to the best in die casting in the Midwest.

BADGER Die Casting Corp.

201 W. Oklahoma Avenue
Milwaukee 7, Wisconsin

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the Matawan General Laboratory.

Mr. Nortof has recently transferred from H-VW-M's Cleveland office, where he was a field electrochemist, to accept his new post at the New Jersey headquarters.

SMITH NAMED SALES REP.

SMITH

MUSCARELLA

Carl R. Smith has joined Hanson-Van Winkle-Munning Company as sales representative in the Company's Kentucky-Tennessee territory with headquarters at Louisville. He replaces Joseph P. Muscarella, Jr., who has transferred to the Philadelphia territory.

Prior to joining H-VW-M, Smith was associated in a sales capacity with a chemical manufacturing firm serving the metal finishing industry.

more industry news on page 106

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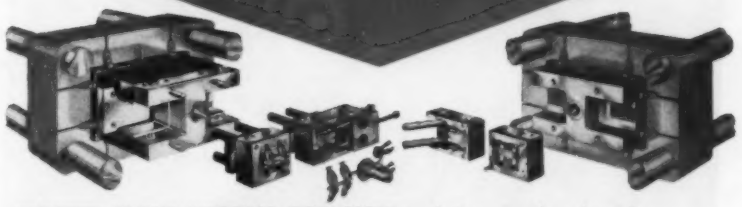
SAVE 70% with MASTER-MOLD



MASTER-MOLD WORKS FOR YOU to bring overhead and operating costs down to a realistic level. **MASTER-MOLD** can save you up to 70% because this new technique eliminates expensive die sets and other costly equipment — slashes set-up time, labor costs . . . **handles two jobs at once.**

Short runs can be handled profitably! Short runs, long runs can be combined, run together — doubling your machine capacity!

Now you can add to your customers the many small manufacturers and experimental workers who cannot bear the cost of conventional die-casting methods.

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From the smallest lock part to a giant rotary mower housing—all designing and production problems are quickly and efficiently solved by Hamilton's engineering staff. With over a quarter century of creative leadership in the field, Hamilton has the answers to your die making and die casting problems.

Long or short runs are handled with ease by Hamilton's versatile array of casting machines. Quality Control ensures that the castings delivered meet all required standards. Latest vacuum equipment available for improved finishes.

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- aluminum
- high pressure castings
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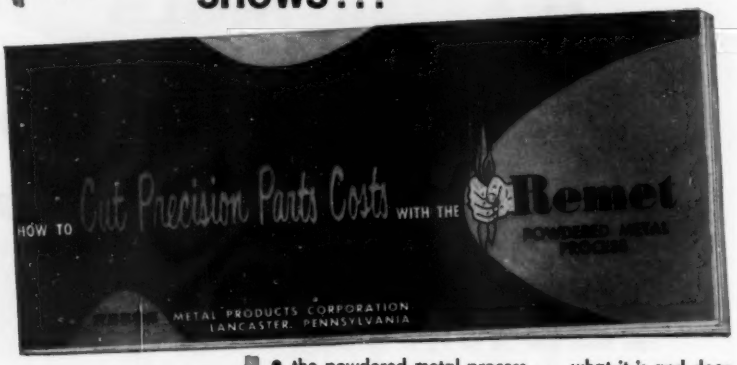
FREE POWDERED METAL PARTS BOOKLET SHOWS . . .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INDUSTRY NEWS *(cont.)*

OPENS SALES OFFICE

Precision Extrusions, Inc. has announced the opening of a new sales office in Grand Rapids.

This action is the second move by the company in 60 days to meet the requirements of an expanding market in Michigan and Northern Ohio, according to James E. Hill, Precision Sales Manager. It follows Precision's establishment of a new district office in Detroit to direct the complete engineering, sales and service activities for aluminum extrusions in that area.

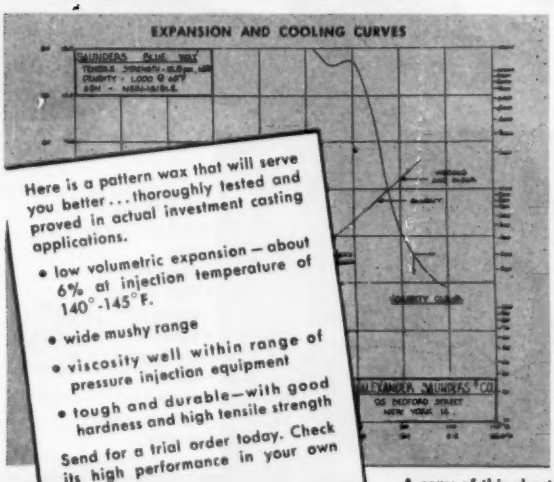
The Grand Rapids sales office will be managed by Frank Buist, Jr., and is under the general direction of Bernard and Jack Ladendorf of the Detroit district headquarters.

NEW WAREHOUSE

H. E. Bauschatz has been named manager of the newly opened Youngstown warehouse of U. N. Alloy Steel Corp. The new warehouse will stock disks and bars of H 12 tool steel available for immediate shipment.

Saunders Blue Wax

...the pattern wax with good character-istics



Here is a pattern wax that will serve you better . . . thoroughly tested and proved in actual investment casting applications.

- low volumetric expansion — about 6% at injection temperature of 140°-145° F.
- wide mushy range
- viscosity well within range of pressure injection equipment
- tough and durable—with good hardness and high tensile strength

Send for a trial order today. Check its high performance in your own foundry.

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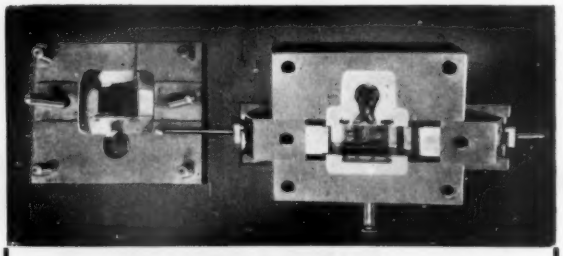

PRECISION DIE MAKING

A new and modern well-equipped plant that was designed and built from the foundation up to manufacture plastic molds and die castings dies exclusively, is ready to go to work for you. Damen offers you complete engineering facilities and manufacture capabilities to build your plastic molds and die casting dies. Loading and crane capacities to handle dies and molds that weigh up to five ton. All requests for quotations get prompt and immediate attention.

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GILBERT APPOINTED

Raymond W. Gilbert has been appointed Eastern district manager of refractory metals development for Climax Molybdenum Company, a division of American Metal Climax, Inc. He replaces Robert R. Freeman who recently was advanced to civilian markets manager for refractory metals.

OLIN NAMES WHITLOCK

James R. Whitlock has been appointed manager of the Olin Aluminum branch sales office at Louisville, Ky. He was previously an industrial sales representative for Olin Aluminum in Chicago.

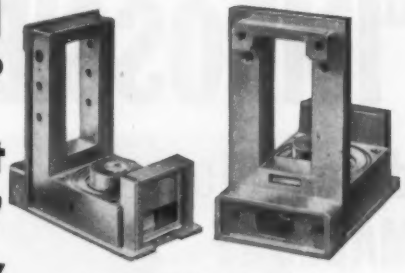
In his new position, Whitlock succeeds Curt D. Hoffman who was recently transferred to the Olin Aluminum Los Angeles office.

APPOINTS SOUTHERN REPRESENTATIVE

Aluminum Extrusions, Inc. has announced the appointment of Perfection Sales Company, Nashville, Tennessee, as its sales representative covering south central United States.

Circle No. 54 on Reader Service Card

Dimensional Accuracy? YES... but Other 'Specs' are Equally Exacting!

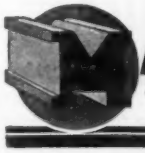


Two views of zinc die-cast body for Air Controlled Timing Valve.

Milwaukee operates under the Certified Zinc Plan of the American Die Casting Institute.

In addition to exacting dimensional tolerances, users of die castings often require other equally precise specifications to be met. For example, in the zinc die-cast body for the Air Controlled Timing Valve pictured, the following requirements were specified to insure successful assembly and functioning: absolute *solidity* and *high density* of the zinc alloy to prevent air leakage — along with a cast-in diaphragm surface absolutely smooth and free from imperfections; bottom of rectangular hole free from burrs; all plane surfaces flat and either parallel or square to one another.

Milwaukee has been meeting *exacting requirements* like these for more than a half century!



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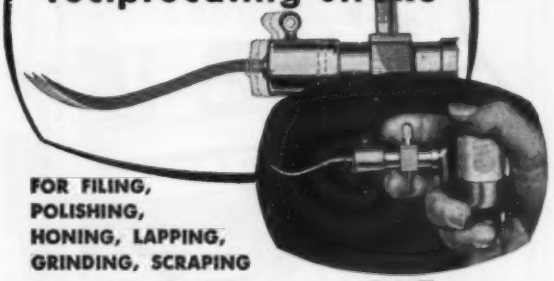

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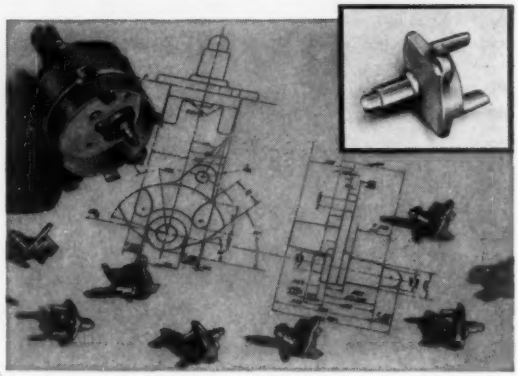

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MELTING MAGNESIUM
(continued)

of the chips shows an operating economy.

The profitability of a melting installation is determined to a large extent by the melt down metal loss. To determine the metal loss it is necessary first to define it. At Volkswagen the metal loss is taken as the loss experienced by oxidation during melting and refining as well as the loss resulting from extremely contaminated chips which are as a rule not returned into the melting cycle but rather resold. It is measured as the difference between the quantity of metal purchased and the overall weight of finished castings used.

From the point of view of the foundry all castings furnished for machining are considered to be "saleable" weight while the input of new ingots, chips and rejects is considered to be "purchased" weight. On the basis of these definitions an average annual metal loss of 3% has been determined.

Since the burning of metal is

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Perhaps you have been looking for a source that specializes in designing and building trim dies.

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caused by oxidation during the melting process, metal loss due to oxidation depends on the melting process and on the quantity of metal melted. Therefore, the total metal loss is determined not only by the melting process adopted but also on the quantity of metal.

The weight ratio between molten metal and finished castings is naturally much better with a well-organized mass production than when producing smaller batches of different castings. Experience indicates that the introduction of die casting in lieu of permanent molds has by itself considerably improved that ratio. Despite manual ladling from holding furnaces to die casting machines a ratio of between 1.25 and 1.35 has been achieved. The range between these two figures is related to the size of the castings. The total quantity of metal to be melted increases over and above this ratio by the quantity of residue remaining at the bottom of the holding furnace crucible after refining and of course by the melt-down loss and rejects. *Part II of this report will appear next month.*

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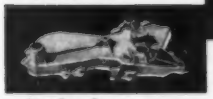

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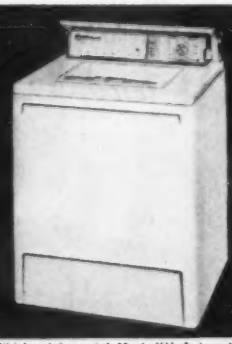

RCA-Whirlpool Imperial Mark XII Automatic Washer

PARAMOUNT—a major supplier of die castings to Whirlpool Corporation for 15 years

Whirlpool quality is recognized throughout the world, quality which stems from the rigid quality standards which Whirlpool demands that its suppliers meet.

Paramount's engineering and production "know-how", its ability to consistently meet Whirlpool's exacting quality standards—as in these die castings for the RCA-Whirlpool Imperial Mark XII Automatic Washer—are the reasons why Paramount has consistently been one of Whirlpool's major suppliers for 15 years.

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This part is a carrier for a stripper on a citrus peeling machine. It is typical of thousands of irregularly shaped components that are designed with only a particular function in mind and no compromise with production limitations. This type of metal part often requires several changes before the design is finalized.

A late design change in this part, cast in 303 stainless steel, incorporated a 45° bevel, top and bottom on both sides of the serrated pad section. The tooling was altered at very little cost while the cost of the finished casting was not increased at all. The relatively low cost of tooling and tooling changes make the investment casting process an economical and flexible method.

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BOOKS

A VISIT WITH "500" DIE CAST PLANTS, Material gathered and compiled by Ed. A. Day, Written by W. C. Kennedy; American Charcoal Co., Detroit, Mich., 1959. 599 pages. Price: $10.00 plus postage.

This book contains fairly detailed discussions on practically every phase of die casting, from metal processing to finishing. Other topics include die design, the casting operation, quality control, vacuum systems, and competing processes to name a few.

One of the intended purposes of the book is to aid new men in the die casting industry in acquiring a practical knowledge of the field. Another purpose is to acquaint die casters with industry practices in parts of the country other than their own. Day says that he has found practices which are common in one area are innovations in another.

To the die caster interested in neither of these objectives, the book is still a handy reference and "trouble-shooting" manual.

TOOL ENGINEERS HANDBOOK, SECOND EDITION, Revised under supervision of American Society of Tool Engineers Technical Publications Committee; McGraw-Hill, New York, N.Y. 2289 pages. Price: $19.50.

This book is a comprehensive reference on all phases of planning, control, design, tooling, and operations in the manufacturing industries. Engineers, manufacturing executives, machinists, and mechanics all probably come up against problems at one time or another where a reference manual such as this is helpful.

Product design, cost estimating, processes, tools, and the analysis and improvement of set-ups and operations are some of the topics covered. There are mathematical tables, commonly used formulas, and reviews of mathematics and strength of materials. Even a table of random numbers is included.

The American Society of Tool Engineers says that this book represents 10 years of planning, writing, and reviewing of material by 387 authorities.

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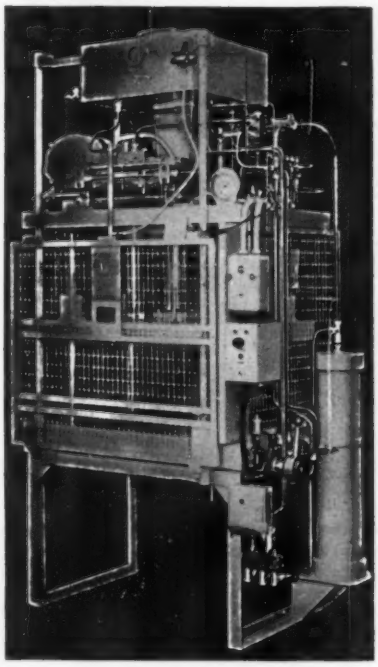

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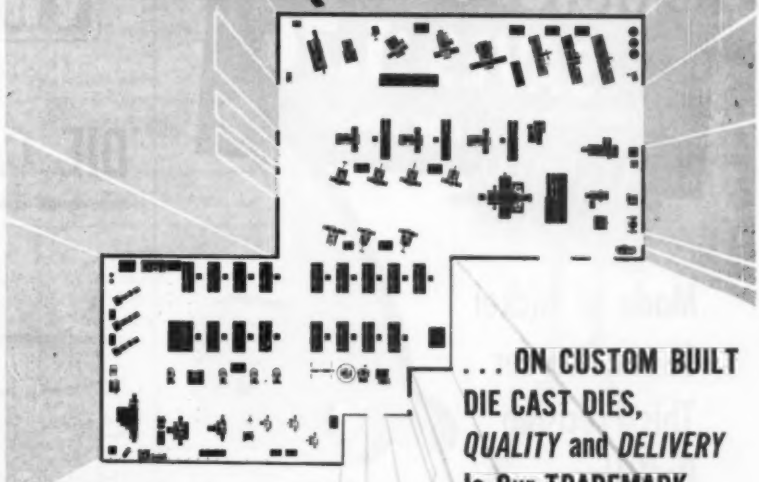

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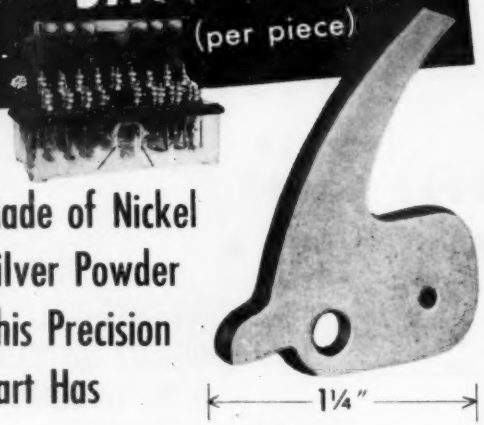

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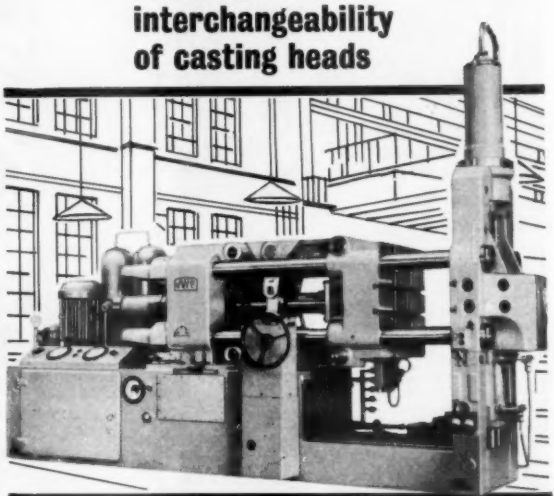

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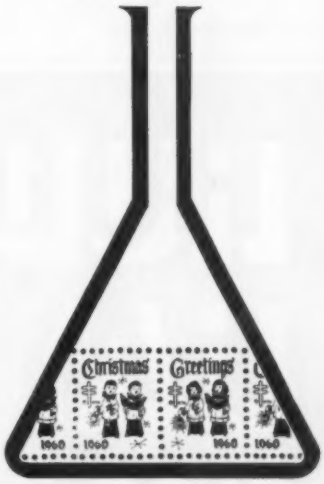

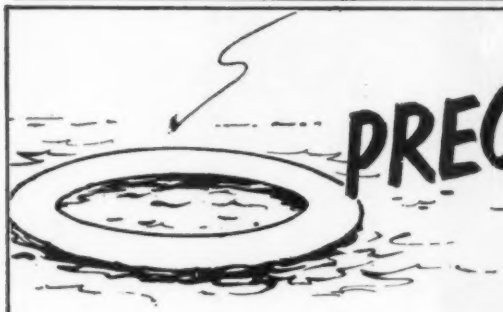

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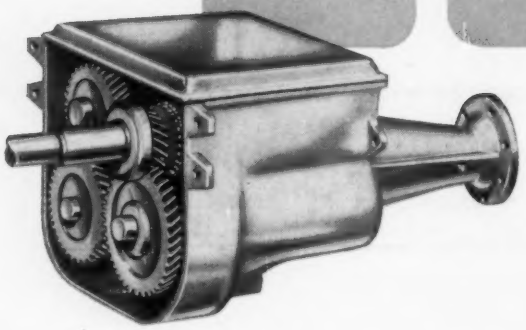

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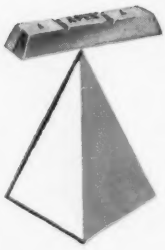

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